Fishery Management Report No. 96-4

Area Management Report for the Recreational Fisheries of the Central Gulf Management Area, 1995

by

Andrew Hoffmann

September 1996

Alaska Department of Fish and Game **Division of Sport Fish**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

FISHERY MANAGEMENT REPORT NO. 96-4

AREA MANAGEMENT REPORT FOR THE RECREATIONAL FISHERIES OF THE CENTRAL GULF MANAGEMENT AREA, 1995

by

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The Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Distribution is to state and local publication distribution centers, libraries and individuals and, on request, to other libraries, agencies, and individuals. This publication has undergone regional peer review.

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PREFACE

This report is divided into two sections. *Section I* presents an introductory overview of the Central Gulf Management Area. Included in this section are a general geographic and organizational description of the management area; an overview of the Alaska Board of Fisheries process and schedules for the management area; an inventory of available fishery resources; a historical perspective of recreational angler effort and harvest within management area waters; an approximation of the economic value of recreational fisheries; and a general description of stocking, research, management, partnership, aquatic education, viewing, and access activities being conducted in the management area. Also included are a summary of the major fishery and social issues that presently occur in the Central Gulf Management Area as well as recommendations for solving them including, but not limited to, research, management, access, regulatory changes, aquatic education, partnership, stocking, or habitat options.

Section II provides a more detailed summary of all major fisheries that occur in the Central Gulf Management Area. Included in this section are a description and historical perspective of each fishery, the management objective(s) for each fishery, a description of recent fishery performance, a description of recent Board of Fisheries actions, a description of any social or biological issues surrounding each fishery, and a description of ongoing or recommended research or management activities for each fishery.

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MANAGEMENT AREA DESCRIPTION

The Central Gulf Management Area (CGMA) includes all waters of the Gulf of Alaska and its drainages west of the longitude of Cape Suckling (143° 53' W longitude), and east of the longitude of Gore Point (150° 57' 30" N longitude), excluding the Copper River drainage upstream of a line crossing the Copper River between the south bank of the confluence of Haley Creek and the south bank of the confluence of Canyon Creek in Wood's Canyon (Figure 1). This management area is comprised of the Prince William Sound (PWS) Regulatory Area (Cape Suckling to Cape Puget) and portions of the Kenai Peninsula (fresh water) and the Cook Inlet-Resurrection Bay Saltwater regulatory areas (Cape Puget to Gore Point)[1].

The Central Gulf Management Area includes the communities of Valdez, Cordova, Whittier, Seward and the native villages of Chenega and Tatitlek. Only Valdez and Seward are accessible by the Alaska Highway system. The Alaska Marine Highway ferries travelers to Whittier, Cordova, Seward, and Tatitlek while Chenega is reachable only by plane or boat. Whittier and Seward are additionally serviced by the Alaska Railroad. With the exception of some road-accessible streams, virtually all sport fisheries in the CGMA are remote and relatively difficult to travel to. Principal land managers in the CGMA include the National Park Service, U.S. Forest Service, various native corporations, and the State of Alaska.

Management and research functions for the CGMA are handled from the Anchorage regional office. In September of 1995 the CGMA was split into two separate areas: Prince William Sound and Resurrection Bay. Activities in the Prince William Sound area are directed by a Fisheries Biologist III area management biologist, Andrew Hoffmann, and assistant area management and research biologists Nicole Szarzi in Glennallen and Todd LaFlamme in Anchorage and seasonally in Glennallen. Activities in the Resurrection Bay area are directed by a Fisheries Biologist III area management biologist, Barry Stratton, and assistant area biologist Paul Cyr. This report, which addresses harvest data through 1994 summarizes activities in both areas. In subsequent years, separate area management reports will be prepared for each area.

Groundfish research and management is directed by a Fisheries Biologist IV, Douglas Vincent-Lang, stationed in Anchorage, and research biologist, Scott Meyer, stationed in Homer. Groundfish issues are managed on a larger scale covering the Gulf of Alaska west of Cape Suckling to the Aleutian Islands. Therefore, groundfish issues will be covered in less detail in this report and the reader is referred to the Area Management Report for the North Gulf of Alaska Recreational Fisheries (Vincent-Lang 1995).

ALASKA BOARD OF FISHERIES ACTIVITIES

The Alaska Board of Fisheries (BOF) is responsible for promulgating regulations in state waters. Public input concerning regulation changes and allocation issues is provided through various means including direct testimony to the Board of Fisheries and participation in local fish and

[1] The Central Gulf Management Area overlaps three regulatory areas. The Prince William Sound Regulatory Area in its entirety represents Area J of the Statewide Harvest Survey. Portions of the Cook Inlet-Resurrection Bay Saltwater and Kenai Peninsula (fresh water) regulatory areas represent a portion of Area P of the Statewide Harvest survey (Howe et al. 1995).

CENTRAL GULF MANAGEMENT AREA

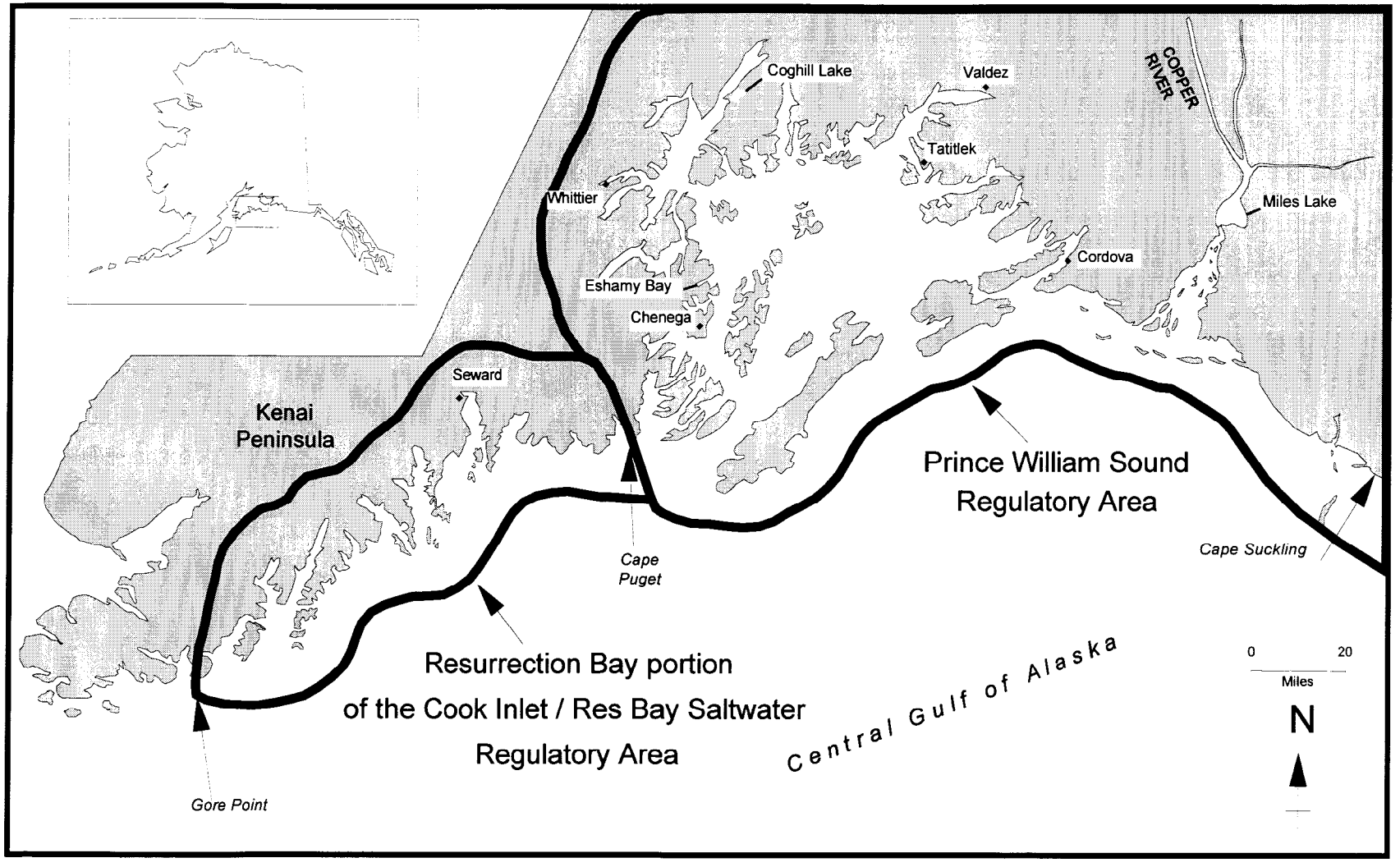

Figure 1.-Map of Central Gulf Management Area and regulatory area components.

game advisory committees. These advisory committees have been established throughout Alaska to assist the Boards of Fisheries and Game in assessing fisheries and wildlife issues and proposed regulation changes. Most advisory committees meet at least once each year, usually in the fall prior to the Board meetings. Staff from the Division of Sport Fish and other divisions of the Alaska Department of Fish and Game (ADF&G) often attend committee meetings. Advisory committee meetings allow for direct public interaction with department staff involved with local resource issues. Within the CGMA there are four Fish and Game Advisory Committees: Valdez, Whittier, Cordova (Copper River/Prince William Sound), and Seward.

Under its current schedule, the Board of Fisheries reviews regulations for each area on a 3-year cycle. Proposals regarding the Resurrection Bay-Cook Inlet Regulatory Area were last considered during the November 1992 Board meetings. The BOF met in the spring of 1996, however, Resurrection Bay issues were deferred to a special meeting scheduled for the fall of 1996. Proposals for the PWS Regulatory Area were heard during the February and March 1994 Board meetings, the next meeting will be in December of 1996. Proposals must be submitted between the time the board issues a call for proposals, usually in December or January, and the deadline set by that call for proposals, usually in early April.

FISHERIES RESOURCE INVENTORY

Sport anglers fishing CGMA waters target five species of Pacific salmon (pink *Oncorhynchus gorbuscha*, coho *O. kisutch*, sockeye *O. nerka*, chum *O. keta*, and chinook *O. tshawytscha*). There are major saltwater sport fisheries for halibut *Hippoglossus stenolepis*, rockfish *Sebastes*, and lingcod *Ophiodon elongatus*. There are also fisheries for Dolly Varden *Salvelinus malma* and cutthroat trout *O. clarki*. The stocking program provides fisheries for rainbow trout *O. mykiss* and Arctic grayling *Thymallus arcticus* in several lakes. Dungeness crab *Cancer magister*, Tanner crab *Chinoecetes bairdi*, king crab *Paralithodes camtschatica*, shrimp Pandalidae, and razor clams *Siliqua patula* are harvested in limited numbers.

The Division of Sport Fish classifies sport fisheries into three categories based on a combination of yield (harvest) and angler-cost criteria.

Level I fisheries are defined as high yield, low angler-cost fisheries. These fisheries are typically entry level fisheries that anglers can participate in at little direct cost.

Level II fisheries fall between Level I and Level III fisheries and are defined as basic yield, intermediate-cost fisheries.

Level III fisheries are defined as low yield, high cost fisheries. These fisheries are typically remote and have a high cost associated with participation.

The CGMA offers primarily Level I and Level III fishing opportunities for recreational anglers. Road-accessible salmon, Dolly Varden, cutthroat trout fisheries and stocked lakes provide Level I fisheries for the residents of the major communities. The remaining waters of the CGMA which are accessible by boat or plane offer Level III fisheries. Examples of Level III fisheries include a sockeye salmon fishery on Eshamy Bay, located in PWS, and halibut fishing around the Chiswell Islands, located near Seward.

RECREATIONAL ANGLER EFFORT[2]

From 1983 through 1993, an average of 146,168 angler-days have been expended by recreational anglers fishing CGMA waters (Table 1). Recreational angler effort was relatively stable from 1977 through 1983 and has been increasing annually since 1983. The estimated sport effort of 210,306 angler-days for the CGMA during 1994 was 44% above the historical average effort for the area and represented 8% and 11% of the total statewide and Southcentral region sport angling effort, respectively (Table 1 and Figure 2).

Historically, the majority of recreational angler effort (approximately 59%) from the CGMA has occurred in PWS. From 1983 through 1993, PWS has supported an average of 85,483 angler-days of sport fishing effort (Table 1). In comparison, average sport effort for Resurrection Bay from 1983 through 1993 has been 60,685 angler-days.

The most popular fishing ports in the CGMA in terms of recreational angling effort have been Seward (Resurrection Bay) and Valdez (Table 2 and Figure 3), the only road-accessible ports in the area. This demonstrates the influence that road access has on angler participation. In 1993, anglers from these two ports accounted for nearly 75% of the recreational angling effort expended in the CGMA. The majority of the angling effort in both ports was expended by saltwater boat anglers. Information is not available to delineate exact locations where all anglers were fishing in the marine waters, but anglers have been traveling further from these ports in recent years as is demonstrated by data from Seward between 1973 and 1995 (Figure 4). From Seward, popular destinations include saltwater areas within Resurrection Bay and near the Chiswell and Granite islands. Some charter operators from Seward are traveling as far east as the waters of southeast Montague Island in Prince William Sound, and as far west as the Pye Islands. Charter operators from the port of Valdez regularly travel to the waters of the northeast shore of Montague Island.

Cordova and Whittier are the next most popular fishing ports in the CGMA. In 1993, anglers expended 14,943 days fishing the marine and fresh waters in the vicinity of Cordova and 16,917 days in the Whittier area (Table 2). Other popular fisheries in the CGMA include saltwater fishing along the shoreline of Eshamy Bay, and Hinchinbrook, Hawkins, and Montague islands located in PWS.

COMMERCIAL AND SUBSISTENCE SALMON HARVESTS

Salmon returning to the CGMA are harvested extensively by various commercial fisheries. For most species, commercial harvests are significantly larger than corresponding recreational harvests. Exceptions are the fisheries for coho and chinook salmon that occur out of Seward. The recreational harvests of these two salmon species are managed under Board direction for a recreational priority (Resurrection Bay Salmon Management Plan 5 AAC 21.366). Lingcod and rockfish harvests from Seward area fisheries are also larger than corresponding commercial harvests; however these fisheries are not granted a similar recreational priority.

Fish stocks of the CGMA are also harvested in various subsistence and personal use fisheries. Harvests in these fisheries are generally small.

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[2] Most CGMA fisheries are not monitored by onsite creel surveys. For this reason, the Statewide Harvest Survey by Mills (1979-1994) and Howe et al. (1995) serves as the basic reference for effort and harvest for most fisheries in the area. It is not possible, because of the nature of the harvest survey, to determine the amount of effort expended on a species-specific basis.

Table 1.-Number of angler-days of effort expended sport fishing in the Central Gulf Management Area (CGMA) from 1983-1994.

Year	Statewide Effort	Southcentral Effort	Central Gulf Effort	Total PWS Effort	Total Res Bay Effort	Percent of Statewide From CGMA	Percent of Southcentral From CGMA
1983	1,732,528	1,212,916	89,764	47,614	42,150	5%	7%
1984	1,866,837	1,341,658	104,226	57,548	46,678	6%	8%
1985	1,943,069	1,406,419	128,421	72,662	55,759	7%	9%
1986	2,071,412	1,518,712	119,623	64,251	55,372	6%	8%
1987	2,152,886	1,556,050	125,520	81,221	44,299	6%	8%
1988	2,311,291	1,679,939	138,000	84,971	53,029	6%	8%
1989	2,264,079	1,583,547	145,793	95,247	50,546	6%	9%
1990	2,453,284	1,745,110	177,920	105,739	72,181	7%	10%
1991	2,456,328	1,782,055	186,745	113,062	73,683	8%	10%
1992	2,540,374	1,889,730	196,986	113,418	83,568	8%	10%
1993	2,559,408	1,867,233	194,851	104,577	90,274	8%	10%
1994	2,719,911	1,966,985	210,306	122,330	87,976	8%	11%
1983-1993 MEAN	2,213,772	1,598,488	146,168	85,483	60,685	7%	9%
% CHANGE of 1994 FROM MEAN	23%	23%	44%	43%	45%		

From: Mills 1984-1994, Howe et al. 1995

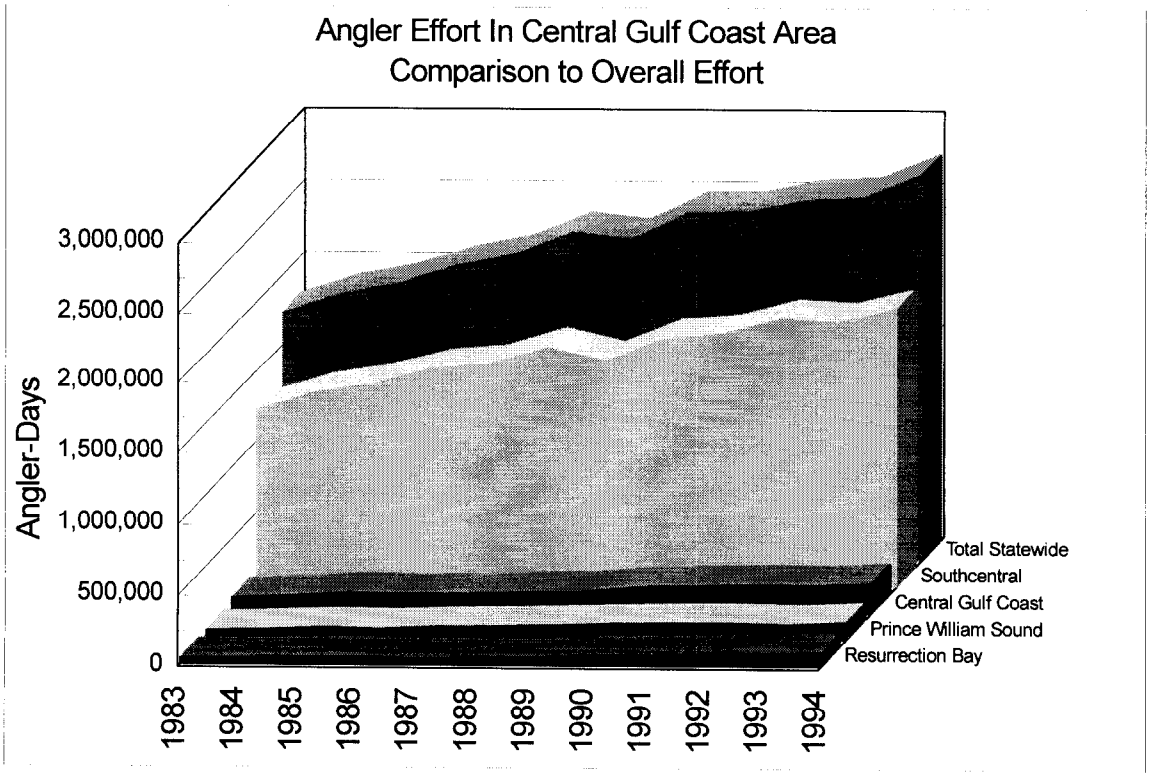


Figure 2.-Relative magnitude of angler effort expended sport fishing in the Central Gulf Management Area.

Table 2.-Number of angler-days of effort by geographical regions in the Central Gulf Management Area, 1983-1994.

Year	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	34	6,946	102	151	34	7,519	2,192	16,052	14,584	47,614	42,150	89,764
1984	417	8,196	401	0	0	6,123	2,259	23,605	16,547	57,548	46,678	104,226
1985	345	1,884	165	314	568	11,064	1,601	51,862	4,859	72,662	55,759	128,421
1986	997	8,394	571	2,568	459	14,176	1,870	32,051	3,165	64,251	55,372	119,623
1987	1,262	10,451	665	852	856	15,028	1,890	48,174	2,043	81,221	44,299	125,520
1988	1,277	6,994	453	1,249	1,498	13,868	3,867	52,108	3,657	84,971	53,029	138,000
1989	1,868	16,818	435	1,365	893	10,148	7,762	49,500	6,458	95,247	50,546	145,793
1990	2,143	9,107	352	1,852	2,749	11,255	3,318	71,909	3,054	105,739	72,181	177,920
1991	1,610	16,070	1,515	1,886	2,475	13,646	3,176	68,794	3,890	113,062	73,683	186,745
1992	4,043	19,222	1,215	2,414	3,825	8,980	4,574	60,952	8,193	113,418	83,568	196,986
1993	3,637	14,943	616	1,509	936	16,917	4,518	53,658	7,843	104,577	90,274	194,851
1994	4,247	19,401	529	2,616	2,982	16,286	6,205	56,329	13,349	121,944	87,976	209,920
1983-1993 MEAN	1,603	10,820	590	1,287	1,299	11,702	3,366	48,060	6,754	85,483	60,685	146,168
% CHANGE of 1994 FROM MEAN	165%	79%	-10%	103%	129%	39%	84%	17%	98%	43%	45%	44%

From: Mills 1984-1994, Howe et al. 1995

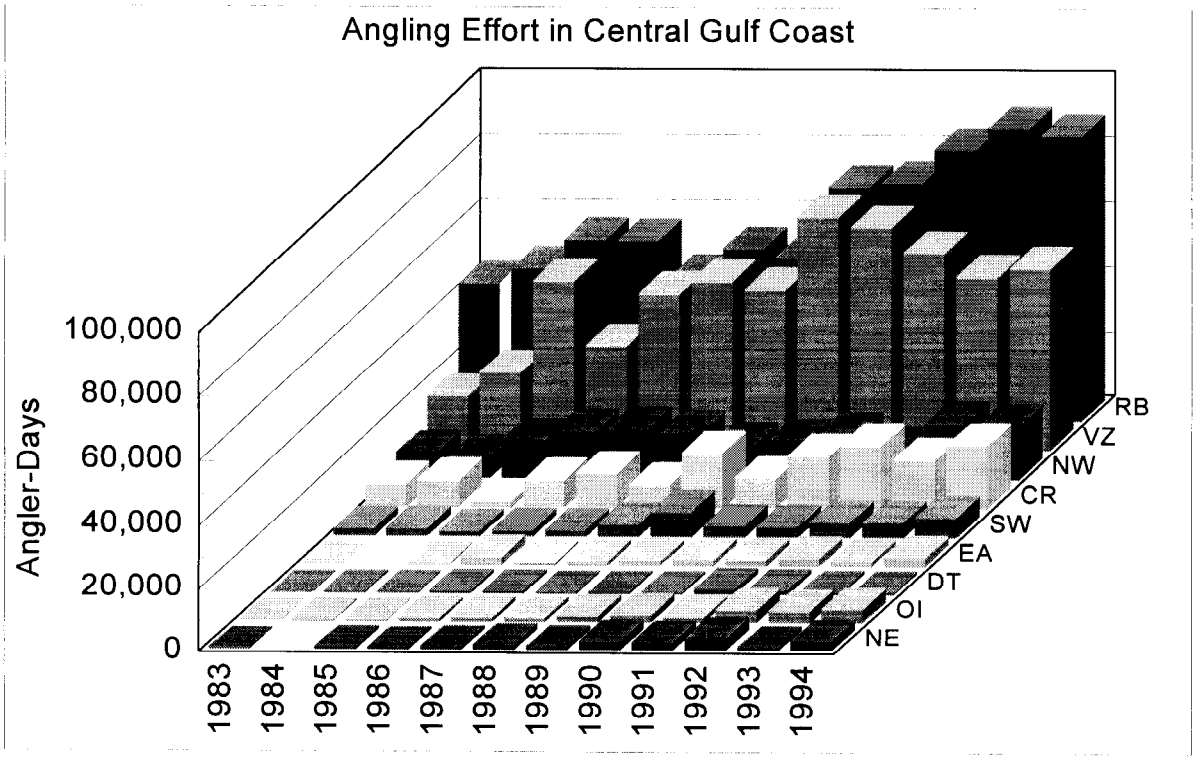
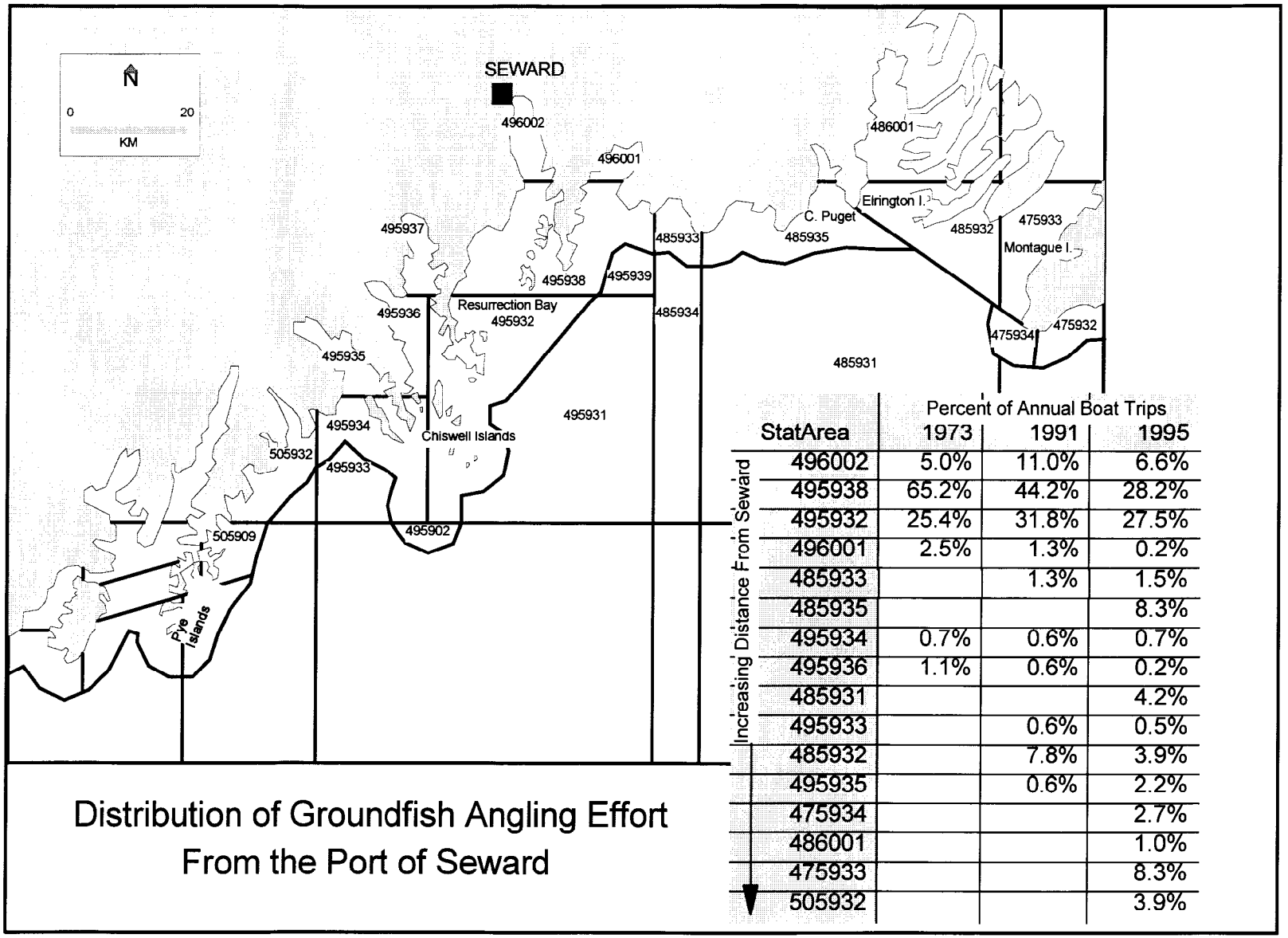


Figure 3.-Major components of angler effort by geographical regions in the Central Gulf Management Area, 1983-1994.



	Percent of Annual Boat Trips		
StatArea	1973	1991	1995
496002	5.0%	11.0%	6.6%
495938	65.2%	44.2%	28.2%
495932	25.4%	31.8%	27.5%
496001	2.5%	1.3%	0.2%
485933		1.3%	1.5%
485935			8.3%
495934	0.7%	0.6%	0.7%
495936	1.1%	0.6%	0.2%
485931			4.2%
495933		0.6%	0.5%
485932		7.8%	3.9%
495935		0.6%	2.2%
475934			2.7%
486001			1.0%
475933			8.3%
505932			3.9%

Increasing Distance From Seward

Figure 4.-Expansion of the area fished for groundfish by the sport fleet based in Seward between 1973 and 1995.

ECONOMIC VALUE OF SPORT FISHERIES

There are no direct estimates of the economic value of the recreational fisheries of the CGMA. However, Jones and Stokes' 1986 survey of Southcentral sport fisheries estimated expenditures and net willingness to pay for resident and nonresident anglers in Resurrection Bay. In 1986, the Seward area coho salmon fishery was estimated to be valued at 1.9 million dollars. A rough approximation of the economic value of all the sport fisheries of the CGMA can be made by applying the direct expenditures per angler-day estimated for Southcentral Alaska resident and nonresident sport anglers to the estimated sport effort of the CGMA (Table 3). Based on this method, the economic value of all of the sport fisheries of the CGMA during 1986 was approximately 15 million dollars. This compares to an estimated value of 127 million dollars for Southcentral Alaska sport fisheries during 1986 (Jones and Stokes Associates, Inc. 1987). Since 1986, the number of angler days expended in the CGMA has increased by approximately 60%, therefore direct expenditures by anglers participating in the fisheries of the CGMA less any inflation are estimated to be at least 24 million dollars.

A more recent statewide economic study has been initiated, however, data are not yet available.

Table 3.-Estimated economic value of Central Gulf Management Area sport fisheries during 1993.

	Southcentral Alaska			Central Gulf Management Area		
Angler Type	Number of Angler-Days[a]	Value of an Angler-Day[b]	Expenditures	Number of Angler-Days[c]	Value of an Angler-Day[b]	Expenditures
Resident	1,301,567	$64.29	$83,677,742	135,823	$64.29	$8,732,049
Non-Resident	565,666	$262.51	$148,492,982	59,029	$262.51	$15,495,734
Total	1,867,233		$232,170,724	194,852		$24,227,783

[a] From Mills 1994.

[b] From Jones and Stokes Associates, Inc. 1987.

[c] Calculated by multiplying Southcentral angler days by the portion of angler effort contributed from CGMA.

STOCKING PROGRAM INVENTORY

Stocking of hatchery raised fish has increased and diversified the opportunities available to anglers in CGMA. Five species of salmon, rainbow trout catchables and fingerlings, and Arctic grayling fry have been stocked in various locations throughout Prince William Sound and Resurrection Bay (Tables 4 and 5). These stocking activities consist of two types of programs: those directed specifically toward enhancing the sport fisheries, and stocking programs that are intended to increase the harvest potential of the commercial fisheries but incidentally enhance the availability of fish for the sport angler. All of the salmon releases contribute to the common property fisheries and are thus available to any fishery regardless of the target group. The

Table 4.-Hatchery releases in PWS 1988-1995, and planned 1996 releases.

Stocking location	Size	Number of fish released								Planned	
		1988	1989	1990	1991	1992	1993	1994	1995	1996	Hatchery[a]
COHO SALMON											
Solomon Gulch Hatchery	Smolt	821,769	986,792	787,153	962,872	1,206,044	461,388	901,303	1,305,316	1,600,000	VFDA - SGH
Boulder Bay	Smolt			20,000	30,761	19,568		13,784	20,000	20,000	VFDA - SGH
Fleming Spit	Smolt		75,113	54,814							State - Ft. Rich
	Smolt				40,000	123,685	99,848	98,628	100,000	50,000	PWSAC - WNH
Whittier Army Dock	Smolt	107,428									State - Ft. Rich
Whittier Harbor	Smolt		82,429	40,912							State - Ft. Rich
Shakespeare Creek, Whittier	Smolt				100,000	143,829	99,951	103,471	102,000	50,000	PWSAC - WNH
Lake Bay	Smolt	871,000	2,499,106	2,397,419	2,083,292	1,563,711	1,103,278	1,282,837	1,862,000	165,000	PWSAC - WNH
CHINOOK SALMON											
Solomon Gulch Hatchery	Smolt					94,748	198,693				PWSAC-VFDA
6.5 MILE Creek, Port Valdez	Smolt				192,000	95,351					PWSAC - WNH
6.5 MILE Creek, Port Valdez	Smolt						196,947				VFDA-SGH
Fleming Spit	Smolt			19,991	60,000	102,116	113,325	99,334	89,000		PWSAC - WNH
Shakespeare Creek, Whittier	Smolt				100,000	102,024	85,677	98,302	102,000		PWSAC - WNH
Lake Bay	Smolt	45,000	144,934	118,610	239,624	274,754	273,429	394,606	400,000	35,000	PWSAC - WNH
Lake Bay	Fry							144,589			PWSAC - WNH
Chenega	Smolt							50,318	50,000	50,000	PWSAC - WNH
PINK SALMON											
Solomon Gulch Hatchery	Fry	114,033,083	114,030,000	75,204,183	82,879,067	86,902,414	141,868,041	149,370,000	205,371,130	215,000,000	VFDA - SGH
Cannery Creek Hatchery	Fry	58,969,539	143,662,511	141,519,850	132,166,231	140,030,396	84,616,614	unavailable	unavailable	141,900,000	PWSAC-CC
Armin F Koening Hatchery	Fry	160,486,843	113,843,914	115,762,047	112,830,588	113,337,345	92,723,581	unavailable	unavailable	114,000,000	PWSAC-AFK
Wally Neurenberg Hatchery	Fry	159,713,663	235,378,496	214,941,068	163,802,656	172,087,494	162,386,766	unavailable	unavailable	180,000,000	PWSAC-WHN
CHUM SALMON											
Solomon Gulch Hatchery	Fry	1,613,896	2,920,000	3,103,886	1,736,374	2,690,414	18,238,446	6,000,000	discontinued		VFDA - SGH
Port Chalmers	Fry									24,000,000	PWSAC-WHN
Wally Noerenberg Hatchery	Fry									80,000,000	PWSAC-WHN
SOCKEYE SALMON											
Eyak Lake	Smolt				47,609	63,822					PWSAC - Main Bay
Coghill Lake	Fry							330,196			PWSAC - Main Bay
Davis Lake	Fry	657,287									PWSAC - Main Bay
Eshamy Lake	Fry				407,000	406,984					PWSAC - Main Bay
Esther Pass Lake	Fry	153,031	154,644								PWSAC - Main Bay
	Fry			25,000							PWSAC - Main Bay
Pass Lake	Fry	594,210	603,219								PWSAC - Main Bay
	Fry			100,000							PWSAC - Main Bay
Coghill River	Smolt				443,000	720,446	806,218	889,158	865,000	0	PWSAC - Main Bay
Marsha Bay	Smolt					691,405	0	0	215,944	0	PWSAC - Main Bay
Eshamy River	Pre-smolt		2,055,000		872,492	1,043,356	966,750	691,633	776,000	0	PWSAC - Main Bay
Eshamy River	Pre-smolt	764,000									PWSAC-WNH
Main Bay	Smolt						0	90,358	82,514	0	PWSAC - Main Bay
Main Bay	Smolt	330,025	3,925,327	2,616,498	1,517,774	826,054	2,597,284	2,400,666	3,719,567	3,200,000	PWSAC - Main Bay
Main Bay	Smolt				845,563	1,025,145	0	761,797	769,575	1,450,000	PWSAC - Main Bay

-continued-

Table 4.-Page 2 of 2.

Stocking location	Size	Number of fish released								Planned	Hatchery[a]
		1988	1989	1990	1991	1992	1993	1994	1995	1996	
ARCTIC GRAYLING											
Mile 31 Lake	Fry	10,000	10,000	10,000	10,000	10,000	10,000	10,000	discontinued		
Mile 28.5 Lake	Fry	10,000		10,000	10,000	10,000	10,000	10,000	discontinued		State - Clear
Alaganik Slough Lake	Fry			10,000	10,000	10,000	10,000	10,000	discontinued		State - Clear
Pipeline Lake # 1	Fry			1,100	10,000	10,000	10,000	10,000	discontinued		State - Clear
Pipeline Lake # 2	Fry		10,000	discontinued							State - Clear
Pipeline Lake # 4	Fry				10,000	10,000	10,000	10,000	discontinued		State - Clear
Sheridan Dike Pond # 1	Fry	10,000		10,000	10,000	10,000	discontinued				State - Clear
Sheridan Dike Pond # 2	Fry	10,000		10,000	10,000	10,000	10,000	10,000	15,000	discontinued	State - Clear
Thompson Lake	Fry	10,000	10,000		10,000	0	10,000	0	10,000	10,000	State - Clear
ARCTIC CHAR											
Worthington Lake	Fry							4,000			State - Clear
Crater Lake	Fry							1,600			State - Clear
RAINBOW TROUT											
Crater Lake	Fingerling	5,762	0	5,009	0	3,400	0	1,600	0	5,000	State - Ft. Rich
Pipeline Lake # 4	Fry			5,200	discontinued						State - Ft. Rich
Granite Bay 171	Fingerling			6,677	discontinued						State - Ft. Rich
Ruth Pond	Catchable	545	1,002	715	1,052	1,021	504	503	1,710	1,000	State - Ft. Rich
Blueberry Lake	Fingerling	2,463	0	2,000	0	2,000	0	2,000	discontinued		State - Ft. Rich
	Catchable								1,038	1,000	State - Ft. Rich
Worthington Lake	Fingerling	8,000	7,970	0	8,014	0	8,000	0	4,000	discontinued	State - Ft. Rich
	Catchable								1,000	1,000	State - Ft. Rich

[a] VFDA - Valdez Fisheries Development Association
SGH - Solomon Gulch Hatchery

State - State operated hatchery
Fort Richardson
Clear

PWSAC - Prince William Sound Aquaculture Corporation
WNH - Wally Noerenberg Hatchery
Main Bay
CC - Cannery Creek
AFK - Armin F. Koernig

Table 5.-Hatchery releases in Resurrection Bay 1988-1995, and planned 1996 releases.

Stocking location	Size		Number of fish released 1988	1989	1990	1991	1992	1993	1994	1995	Planned 1996	Hatchery[a]	Brood stock
COHO SALMON													
Bear Lake	Fry (0)		347,173	491,340	333,211	390,060	203,800	450,000	320,000	509,000	450,000	CIAA - Trail Lakes	Bear Lake
Bear Creek	Fry (0)							170,588			0	CIAA - Trail Lakes	Bear Lake
	Smolt (1)				93,694		51,733			7,400	0	CIAA - Trail Lakes	Bear Lake
Lowell Creek	Smolt (1)		63,806	66,606	63,733	30,400	59,492	64,361	38,000	50,698	60,000	State - Elmendorf	Bear Lake
Seward Lagoon	Smolt (0)			93,353	88,777	84,057	98,700	40,635	78,565	13,475	0	State - Elmendorf	Bear Lake
	Smolt (1)		118,741	58,808	56,842	35,000	55,519	118,480	143,012	120,225	120,000	State - Elmendorf	Bear Lake
TOTAL			529,720	710,107	636,257	539,517	469,244	844,064	579,577	700,798	630,000		
CHINOOK SALMON													
Lowell Creek	Smolt (0)		95,673	122,800	216,220	93,200	108,390	104,870	104,477	95,000	105,000	State - Elmendorf	Crooked Cr.
Seward Lagoon	Smolt (0)	Early	109,020	109,464	112,831	99,665	114,810	107,230	96,650	106,000	105,000	State - Elmendorf	Crooked Cr.
		Late							68,946	115,000	105,000	State - Elmendorf	Kasilof River
	Smolt (1)					273,500	147,000	86,560				CIAA - Crooked Cr.	Kasilof River
Spring Creek	Smolt (0)			75,063								State - Elmendorf	Crooked Creek
TOTAL			204,693	307,327	329,051	466,365	370,200	298,660	270,073	316,000	315,000		
SOCKEYE SALMON													
Bear Lake	Fry (0)				2,240,000		878,529	1,765,900				CIAA - Trail Lakes	Big River
	Fry (0)				20,185	1,530,000	917,100					CIAA - Trail Lakes	Upper Russian
	Fry (0)		3,047,000					44,400	168,772	330,000	1,600,000	CIAA - Trail Lakes	Bear Lake
Bear Creek	Smolt (1)				158,816	74,922	565,489					CIAA - Trail Lakes	Big River
Grouse Lake	Smolt (1)								574,345	283,000	250,000	CIAA - Trail Lakes	variable
TOTAL			3,047,000	0	2,419,001	1,604,922	2,361,118	1,810,300	743,117	613,000	1,850,000		

State - State operated hatchery
Elmendorf Hatchery

CIAA - Cook Inlet Aquaculture Association
Trail Lakes Hatchery
Crooked Creek Hatchery

releases of resident species, while common property, are almost exclusively harvested by sport anglers.

Those programs directed toward enhancing sport fisheries include the stocking of rainbow trout and grayling raised at one of the state-operated hatcheries (Fort Richardson, Elmendorf, or Clear hatcheries) and the release of salmon raised at private nonprofit (PNP) hatcheries. Currently no state-run hatchery facility raises salmon for sport releases in PWS or Resurrection Bay, although all of the PNP hatcheries (except Valdez Fisheries Development Association, VFDA) were initially started as state facilities. The releases of salmon by the PNP hatcheries for enhancement of sport fisheries consist of an extensive coho and chinook program in Resurrection Bay (Cook Inlet Aquaculture Association, CIAA); pink and coho salmon in Valdez Arm (VFDA); and coho and chinook at Whittier and at Fleming Spit in Cordova (Prince William Sound Aquaculture Corporation, PWSAC).

The commercial salmon releases include releases of pink, chum, and sockeye salmon at various locations throughout the area. In Resurrection Bay the primary commercial releases are sockeye salmon released by CIAA. Pink salmon are released from three PWSAC hatcheries and one VFDA hatchery in PWS. Sockeye salmon are released from one PWSAC hatchery and at several remote releases in PWS. Chum salmon are released from one hatchery and at one remote location in PWS by PWSAC.

PRINCE WILLIAM SOUND REGIONAL PLANNING TEAM

Title 16, Sec. 16.10.380 stipulates that the commissioner will establish regions and regional planning teams (RPT) for the purpose of developing comprehensive salmon management plans for various regions of the state. A regional planning team has been established for Prince William Sound. The team is comprised of representatives from the regional private nonprofit hatchery corporation (Prince William Sound Aquaculture Association), commercial fishers, and representatives from two ADF&G fisheries divisions. The RPT develops and recommends regional comprehensive salmon plans for approval by the Commissioner of ADF&G, solicits public input and arranges for public review of the plans throughout the region, reviews and comments on hatchery permit applications and other proposed enhancement and nonregulatory rehabilitation projects, and reviews and comments on proposed hatchery permit suspensions and/or revocations.

The Prince William Sound RPT has finalized a Phase III plan for salmon production in PWS. Key components in the plan include proposed salmon production numbers for each hatchery in PWS and criteria for evaluating remote releases.

ACCESS PROGRAMS

The Wallop-Breaux Amendments to the Federal Aid in Sport Fish Restoration program mandate that at least 12.5% of the federal funds passed on to states be used on the development and maintenance of boating access facilities. A broad range of access facilities can be approved for funding if constructed to achieve an ADF&G fishery management objective. These facilities can include boat ramps and lifts, docking and marina facilities, breakwaters, fish cleaning stations, rest rooms and parking areas. There are no currently active access projects in the CGMA, however there are six proposed or potential projects and two access projects that have been completed.

Potential access projects (listed in order of priority at time of printing):

1. South Esther Island Public Use Dock: Alaska State Parks manages 19 marine parks in the CGMA (14 in PWS and 5 in Resurrection Bay). The development of these parks will follow demonstrated public use trends. The marine park on the south shore of Esther Island has experienced sharp increases in recreational angling activity because of the returns of four species of salmon to the hatchery in Lake Bay, and its ease of access by boat and float plane. This increase in angler activity has increased conflicts with the hatchery facility and increased degradation of the shoreline. Recreational angling is anticipated to increase even more when the Whittier Access Project is completed in the spring of 1999. Alaska State Parks has formally requested assistance from ADF&G for the construction of a public use dock similar to the structure just completed in Kachemak Bay at Halibut Cove Lagoon. The Halibut Cove Lagoon project was also a cooperative effort with Parks and ADF&G using access funding. The South Esther project plans consist of the construction of a dock system that includes a floating dock connected to shore with a detachable ramp system, a staging pad blasted from the granite boulder hillside, a vaulted latrine, and a marine spar floating moorage system that works in conjunction with the dock. A few dock/mooring systems are being considered with the final system dependent on engineering and design recommendations. The estimated cost of this project will be approximately $500,000. This dock would complement the plans that Alaska State Parks has for the development of camping facilities, public use cabins, fish cleaning tables and trails to be established for recreational anglers. This project directs anglers away from the hatchery facility and avoids future conflicts and injuries to the public and the resource.

2. Mooring Buoys: The U.S. Forest Service (USFS) and Alaska State Parks currently maintain several mooring buoys in PWS and along the eastern Kenai Peninsula. ADF&G Sport Fish Division has been working with State Parks to install mooring buoys in the Cook Inlet area and have identified potential sites in PWS and Resurrection Bay. Currently State Parks is evaluating their maintenance program to determine whether they would be able to maintain additional buoys in the CGMA. If they determine that they could maintain additional buoys, an access project could be developed to work in cooperation with them to identify additional sites or replace lost or damaged buoys. These could be purchased through the access program and turned over to these agencies for installation and maintenance.

3. Whittier Shoreline Development: A proposed project at Smitty's Cove in Whittier to construct a recreational boat launch has fallen through due to unresolved property ownership and potential for competing with private enterprise. However, several other projects could be developed to provide better access and facilities for anglers. Sanitation and fish cleaning facilities could be provided along the breakwaters surrounding the small boat harbor and at Cove and Shakespeare creeks, two of the most popular fishing sites. An informational kiosk could be developed to inform anglers of fishing opportunities around Whittier and throughout western PWS, management concerns for local fisheries such as lingcod and rockfish, and general life history information of fishes in PWS. It is likely that anglers will be able to drive to Whittier by the late 1990s. With an aggressive enhancement program and improved access, the Whittier area has the greatest potential of all the ports in PWS to provide increased fishing opportunities. Recent conversations with the Whittier city engineer and Harbormaster indicate that there is potential for Sport Fish Division's participation in the

current harbor upgrade planning. In addition inquiries have been made regarding the development of a marine park at Shotgun Cove which is easily accessible by boat from Whittier.

4. Boat Harbor Directory: A directory of boat harbors in Southeast Alaska was recently completed as an access project for recreational boaters. The development of a similar directory to include Prince William Sound and the eastern Kenai Peninsula would be a valuable asset to recreational boaters in Southcentral Alaska. There are very few actual boat harbors in PWS, however there are several mooring buoys maintained by the USFS and State Parks, and traditionally used safe anchoring points. These could also be included in the directory. This directory could potentially include the Kodiak and Cook Inlet areas.

5. Valdez Area Facilities: The Valdez area supports the largest sport fishery in PWS and the second largest in the CGMA. The majority of this effort is by boaters in salt water. Projects that could improve boating facilities in the Valdez area should be investigated. Recent conversations with the DOT engineer stationed in Valdez indicated that an excellent use of Sport Fish effort and dollars would be the expansion of the Valdez harbor to provide increased docking facilities for recreational boaters. This could consist of an additional ramp, docks and parking similar to the project just completed in Seward.

6. Village Recreational Facilities: The villages of Chenega and Tatitlek have limited facilities for recreational boaters. Current facilities are primarily used by locals and commercial fishermen. Availability of recreational facilities such as pumpout stations, rest room facilities and docking or mooring facilities would increase opportunities for recreational boaters while not impacting current use patterns.

Completed projects are:

1. Allison Point Access Project. An access project at Allison Point near Valdez was completed in the summer of 1994. Allison Point is the most popular shore fishing site in the Valdez area and draws large numbers of anglers and tourists each year, many arriving by motor home. Anglers harvested approximately 23,000 pink salmon and expended 25,000 angler-days at Allison Point in 1990. Allison Point is one of only two locations in the Valdez area where shore-based anglers can effectively harvest pink and coho salmon. Prior to this project, access to the beach at Allison Point was crude and hazardous. The large boulders forming the embankment that parallels the beach near Allison Point were difficult and dangerous to traverse. Limited sanitation facilities and garbage receptacles were provided during the summer by the City of Valdez.

   The access project for Allison Point provided a developed trail to the beach for shore anglers, upgraded the existing parking area, and constructed permanent rest room facilities and garbage receptacles. The trail, rest rooms, and parking spaces were constructed to accommodate handicapped anglers. The Allison Point access project was a cooperative agreement between the City of Valdez, Alaska Department of Fish and Game, and Alaska Department of Transportation and Public Facilities. The total cost of the project was approximately $140,000.

2. Seward Harbor Boat Ramp. In response to a request from the City of Seward, the department has assisted in constructing an additional boat ramp for the Seward Boat Harbor. Because of

Seward's proximity to Anchorage and increased recreational fishing in the area, boaters were overwhelming existing facilities. Effort had increased approximately 50% in the 6 years prior to initiating the project, from approximately 55,000 angler-days in 1986 to 74,000 angler-days in 1991. With the increase in use, especially during the coho salmon derby, the harbor was extremely congested. The impact of the congestion at the existing boat ramp caused long delays in launching vessels due to the difficulty in finding parking which is often in excess of one-half mile from the ramp. The City of Seward did not have the financial capability to meet all the increasing demands for public use.

An additional boat ramp was constructed on the east side of the harbor. This ramp split the traffic flow from the existing ramp and opened up new parking areas adjacent to the newly constructed ramp. The primary advantage of having adequate parking adjacent to the ramp is the reduction of launch and retrieval time for the boat owner, thereby improving traffic flow near the facility, with a cost of approximately $468,000. Construction was completed by early summer of 1995.

Seward has also received a $40,000 grant for a sewage pumpout station to be installed on harbor floats. This station will be accessible by recreational and commercial watercraft.

MANAGEMENT AREA FISHERY OBJECTIVES

Fishery objectives for CGMA sport fisheries continue to evolve as each fishery becomes better understood. Unless specific fishery objectives have been established and are described in Section II of this report, the objective of past and current fisheries management is to assure the sustained yield of the various fish stocks that occur within the CGMA, while assuring continued, and where possible expanded, opportunity to participate in fisheries targeting these stocks. The specific fishery objectives that have been developed are for the sport fisheries supported by hatchery releases of coho and chinook salmon in Resurrection Bay and at the ports of Valdez, Cordova, and Whittier.

MANAGEMENT PLANS AFFECTING SPORT FISHERIES IN THE CGMA

The Board of Fisheries has established several management plans and policies to guide the fisheries of the CGMA. These plans provide for the sustained yield of the area's fisheries as well as establishing allocations and management guidelines for department fisheries managers. Management plans and policies established for the CGMA include:

1. Bear Lake Management Plan 5 AAC 21.375. This management plan establishes guidelines for the enhancement of coho and sockeye salmon in Bear Lake near Seward. In essence, the plan provides for the enhancement of sockeye salmon in Bear Lake intended for commercial use in Resurrection Bay, provided the enhancement does not negatively impact coho salmon smolt production from Bear Lake.

2. Resurrection Bay Salmon Management Plan 5 AAC 21.376. This management plan provides allocation and management guidelines for the salmon fisheries of Resurrection Bay. In essence, the plan stipulates that the coho and chinook salmon fisheries of Resurrection Bay be managed exclusively for recreational uses and provides for a commercial fishery for other salmon species insofar as the prosecution of these fisheries does not interfere with the recreational fishery in Resurrection Bay.

3. Lower Cook Inlet Seine Fishery Management Plan 5 AAC 21.369. This management plan stipulates that the seine fishery in Lower Cook Inlet waters be managed so that its efforts be directed primarily on Lower Cook Inlet salmon stocks and not Upper Cook Inlet salmon stocks.

4. Copper River District Salmon Management Plan 5 AAC 24.360. This management plan provides for a limited chinook salmon commercial fishery during years when the Copper River District commercial sockeye salmon fishery is closed by permitting use of large mesh gillnets. The plan also provides department fishery managers with specific management guidelines for this fishery.

5. Port San Juan Salmon Hatchery Management Plan 5 AAC 24.365. This plan stipulates that the department, in consultation with the hatchery operator, shall manage the Point Elrington and Port San Juan fishing subdistricts to achieve Prince William Sound Aquaculture Corporation's (PWSAC) escapement goal for the Port San Juan Salmon Hatchery.

6. Solomon Gulch Salmon Hatchery Management Plan 5 AAC 24.366. This plan stipulates that the department, in consultation with the hatchery operator, shall manage the Valdez Narrows fishing subdistrict to achieve the Valdez Fishery Development Association's pink salmon escapement goal for the Solomon Gulch Salmon Hatchery. The plan further stipulates the department may manage those waters of Valdez Arm south to the latitude of Rocky Point to assist meeting this goal. The plan also defines a terminal harvest area for the Solomon Gulch Hatchery.

7. Main Bay Salmon Hatchery Management Plan 5 AAC 24.367. The purpose of this management plan is to provide an equitable distribution of harvest opportunity and to reduce conflicts between users in the vicinity of the Main Bay Salmon Hatchery. The plan also provides department fishery managers with specific management guidelines to accomplish this goal.

8. Esther Island Hatchery Management Plan 5 AAC 24.368. This plan stipulates that the department, in consultation with the hatchery operator, shall manage the Esther Island fishing subdistrict to achieve PWSAC's escapement goal for the Esther Island Salmon Hatchery. The plan also provides department fishery managers with specific management guidelines to accomplish this goal.

9. Prince William Sound Pot Shrimp Fishery Management Plan 5 AAC 31.260. This management plan provides department fishery managers with specific management guidelines and harvest strategies for the pot shrimp fishery in Prince William Sound.

10. Copper River Subsistence Salmon Fisheries Management Plan 5 AAC 01.647. The purpose of this management plan is to ensure that an adequate escapement of salmon in the Copper River occurs and that subsistence uses, as described under AS 16.05.251 and 5 AAC 99.010, are accommodated. The plan also provides department fishery managers with specific management guidelines for this fishery.

11. Prince William Sound Subsistence Salmon Fisheries Management Plan 5 AAC 01.648. This management plan provides department fishery managers with specific management guidelines for the Prince William Sound subsistence salmon fishery.

12. Prince William Sound Herring Management Plan 5 AAC 27.365. The purpose of this management plan is to describe management strategies for all Prince William Sound herring fisheries and to provide for an optimum sustained yield and an equitable allocation for all user groups. The plan also provides department fishery managers with specific management guidelines for this fishery.

Private Nonprofit Salmon Hatchery Special Harvest Area 5 AAC 40 Article 2. This article provides for special harvest areas for private nonprofit salmon hatcheries. Included are:

13. Prince William Sound Aquaculture Corporation Special Harvest Area-San Juan: 5 AAC 40.035.

14. Solomon Gulch Special Harvest Area-Valdez: 5 AAC 40. 038.

Rockfish management plans are:

15. North Gulf Coast (5 AAC 28.465).

16. Prince William Sound (5 AAC 28.265).

17. Cook Inlet (5 AAC 28.365).

These management plans establish trip limits for allowable rockfish landings during a 5-day period for the North Gulf Coast, Prince William Sound, and Cook Inlet areas. The plans also establish harvest quotas for each area (150,000 pounds) after which the fishery in an area reverts to bycatch only.

MAJOR BIOLOGICAL AND SOCIAL ISSUES FOR THE CGMA

Following is a summary of the major biological issues surrounding the CGMA sport fisheries. Groundfish (halibut, rockfish and lingcod) issues are covered in more detail in the North Gulf Coast groundfish annual management report (Vincent-Lang 1995).

Lingcod Stocks

Data indicate recruitment of young lingcod into populations in Gulf of Alaska coastal areas between Cape Puget and Nuka Bay is declining. The portion of the sport harvest consisting of lingcod under 27 inches in length has decreased from about 19% in 1987 to 1.5% in 1991. This decline is accompanied by increasing sport landings of lingcod in Seward. Lingcod are territorial, inhabiting rocky reefs that are easily overfished. Charter boat operators indicate that lingcod populations within range from the Port of Seward are severely depressed and anglers are having to travel further from port to maintain high catch rates. The Board of Fisheries adopted regulatory proposals in November 1992 that address many of these biological concerns. These Board actions will be reviewed in the lingcod fisheries chapter in Section II of this report.

Yelloweye and Black Rockfish Stocks

Concern for rockfish stocks arises from their inherent susceptibility to overexploitation. Most rockfishes are territorial for much of the year, inhabiting high-relief, rocky areas easily found and exploited by sport and commercial users. Over a dozen rockfish species are caught by sport anglers and many of these species are long-lived with high natural mortality rates. Most species do not recruit to sport or commercial fisheries until maturity at age 7-15. For these reasons, recovery from overharvest can take many years. Limited data from commercial test fishing and sport fishing near Resurrection Bay suggest that the abundance of older black rockfish has

declined since the early 1980s (Vincent-Lang 1991). To date, resource agencies have not been able to design strategies to manage rockfish on a sustained-yield basis. One suggestion is to set aside sanctuaries where all bottom fishing is prohibited. These sanctuaries would then act as the possible brood or reseeding source for surrounding areas that have been overharvested.

Cutthroat Trout in Prince William Sound

Prince William Sound is at the most northern and western extreme of the natural range for cutthroat trout. As a result, the populations of this species are small in size and distribution. Populations of fish on the outer extremes of their distribution tend to be more susceptible to environmental changes and their survival rates are highly variable. Cutthroat trout are also subject to incidental catch in the commercial fisheries which adds further risk to these small stocks. The department is concerned whether the present small harvest is sustainable. Some specific cutthroat trout stocks in the Pacific northwest have been selected as candidates for being listed as threatened species under the Endangered Species Act. Careful management is necessary to avoid this possibility for the PWS stocks. The department submitted a proposal to the BOF for the 1993-1994 meeting to establish a spring spawning season closure for PWS from April 15 through June 14, which was approved by the Board.

Coghill and Eshamy Lakes Sockeye Salmon Escapement

Historically, Coghill and Eshamy lakes have produced the highest sport harvest of sockeye salmon in PWS. These two systems accounted for slightly over 60% of the total PWS sport harvest for sockeye in 1978 and this percentage decreased drastically to less than 7% in 1990. In 1991, both of these systems were closed to harvest of sockeye salmon by emergency order and the escapement goal was once again not met for Coghill Lake in 1992. Efforts to rehabilitate these systems with salt-water reared sockeye salmon smolt produced at PWSAC's Main Bay hatchery were ineffective and have been discontinued.

The Coghill Lake run, through intensive management actions by the Commercial Fisheries Management and Development Division (CFMD) area biologist and lake fertilization efforts funded by *Exxon Valdez* Oil Spill (EVOS) restoration monies, has demonstrated an increase in returns. Escapement was met in Coghill Lake in 1995 and 1996. The wild return at Eshamy Lake continues to be weak.

Stocking Program

The chinook and coho salmon stocking programs in Whittier and Cordova have been cut back or discontinued by the Prince William Sound Aquaculture Corporation in order to bring a problem with bacterial kidney disease under control. Residents of Whittier in particular are concerned about the impact this will have on the fisheries in Passage Canal, and requests have gone to the Governor’s office to supplement this fishery using the state hatchery system. Currently the state hatchery system is fully utilized with regard to chinook and coho salmon production. Long-term planning by both the state and PWSAC has begun to address this issue. PWSAC is conducting disease screening to produce disease free stocks and is evaluating a Copper River brood stock to replace the current Deshka River stock. In addition they have plans to modify the rearing areas at the Wally Noerenberg Hatchery on Esther Island to provide better conditions for the fry. The state hatchery at Fort Richardson is gaining access to additional water sources which will increase the capacity at that facility for rearing chinook and coho salmon. As the increased capacity comes on line additional fish could be produced for release in PWS.

Currently the state hatchery system provides fish for a limited number of lakes in the CGMA. The number of lakes has been reduced in recent years. One lake in the Cordova area is currently being stocked with rainbow trout fry and four lakes in the Valdez area are stocked with rainbow trout or Arctic grayling. The future direction of the hatchery program in the CGMA is to continue the current lake stocking program and to evaluate the potential for the development of anadromous chinook and coho salmon stocking in selected road-accessible sites in PWS.

Road to Whittier

The Department of Transportation has approved plans to establish road access into Whittier by modification of the current railroad tunnel system. This project is expected to be completed before the end of the '90s. In response, the City of Whittier has begun the planning process for the expansion of the harbor to more than double its capacity. These developments have the potential of drastically changing the character of the fisheries in western PWS. The department will continue to examine access and stocking programs to accommodate this increase in participation, as well as evaluating and developing fishery objectives to maintain and protect the current fisheries.

SECTION II: MAJOR FISHERIES OVERVIEW

The fisheries in the CGMA fall into three discreet geographical or management units: Prince William Sound (PWS), Resurrection Bay, and areawide fisheries. Some fisheries are managed similarly over the entire area while other management objectives are specific to the Resurrection Bay or Prince William Sound areas. Fisheries that will be discussed areawide include those for groundfish (halibut, rockfish and lingcod), shellfish and several minor species. The major fisheries in the Resurrection Bay area are essentially separate geographic and management units from the rest of the management area. These include a very popular coho salmon fishery, as well as chinook, pink and sockeye salmon fisheries. The groundfish fisheries in the Resurrection Bay area are fairly discreet, however they will be discussed areawide because of their management strategy. In addition groundfish are addressed in more detail in a groundfish management report (Vincent-Lang 1995). Fishing activities in the Resurrection Bay area originate almost entirely out of the Port of Seward. Prince William Sound fisheries are divided into eight geographically distinct areas (Figure 5). Fishing activities in the Prince William Sound area originate primarily out of the three major ports of Valdez, Cordova, and Whittier.

The discussion of the fisheries that follows will be presented briefly by port, then in more detail by individual fishery. Harvest and effort data in the detailed discussion by fishery will be presented by the single geographic region for Resurrection Bay (RB) and eight geographic regions for PWS areas (Figure 5), unless otherwise indicated. The eight geographic regions for PWS are: Northwest (NW), Northeast (NE), Valdez Area (VZ), Eastern (EA), Outer Islands (OI), Southwest (SW), Cordova Road System (CR) and the Copper River Delta (DT). A final category "Other" (OT) is included for those sites which were reported in the SWHS without adequate information to assign data to a specific region (e.g. PWS boat).

PORT OF VALDEZ FISHERIES

The waters of the Valdez area (Appendix A1) support the most popular fisheries in the PWS area and Valdez is the second most popular port in the CGMA in terms of recreational angling effort expended since 1983. Sport fish effort in the Valdez area has been steadily increasing since 1983. In 1983, the Valdez area fisheries accounted for 18% of the total effort expended in the CGMA and in 1994 this had increased to 27% of total effort (Table 2). On average, approximately 97% of angler effort in Valdez is expended in marine waters (Table 6). In 1994, 54,730 angler-days were expended in the marine waters which represents a 17% increase from the historical mean (Table 6, Figure 6). Over 70% of the effort expended in marine waters is by anglers using boats (Howe et al. 1995). These anglers use the Valdez harbor to access marine waters throughout PWS from Hinchinbrook Entrance to Esther Island. It is not possible to delineate exact fishing locations from the Statewide Harvest Survey.

There are seven major fisheries that occur in the Valdez area. These fisheries target five species of salmon, bottomfish, and Dolly Varden. In terms of numbers of fish harvested, the most popular fisheries are those that target pink and coho salmon. In terms of angler effort, the most popular fisheries are those that target coho salmon and halibut.

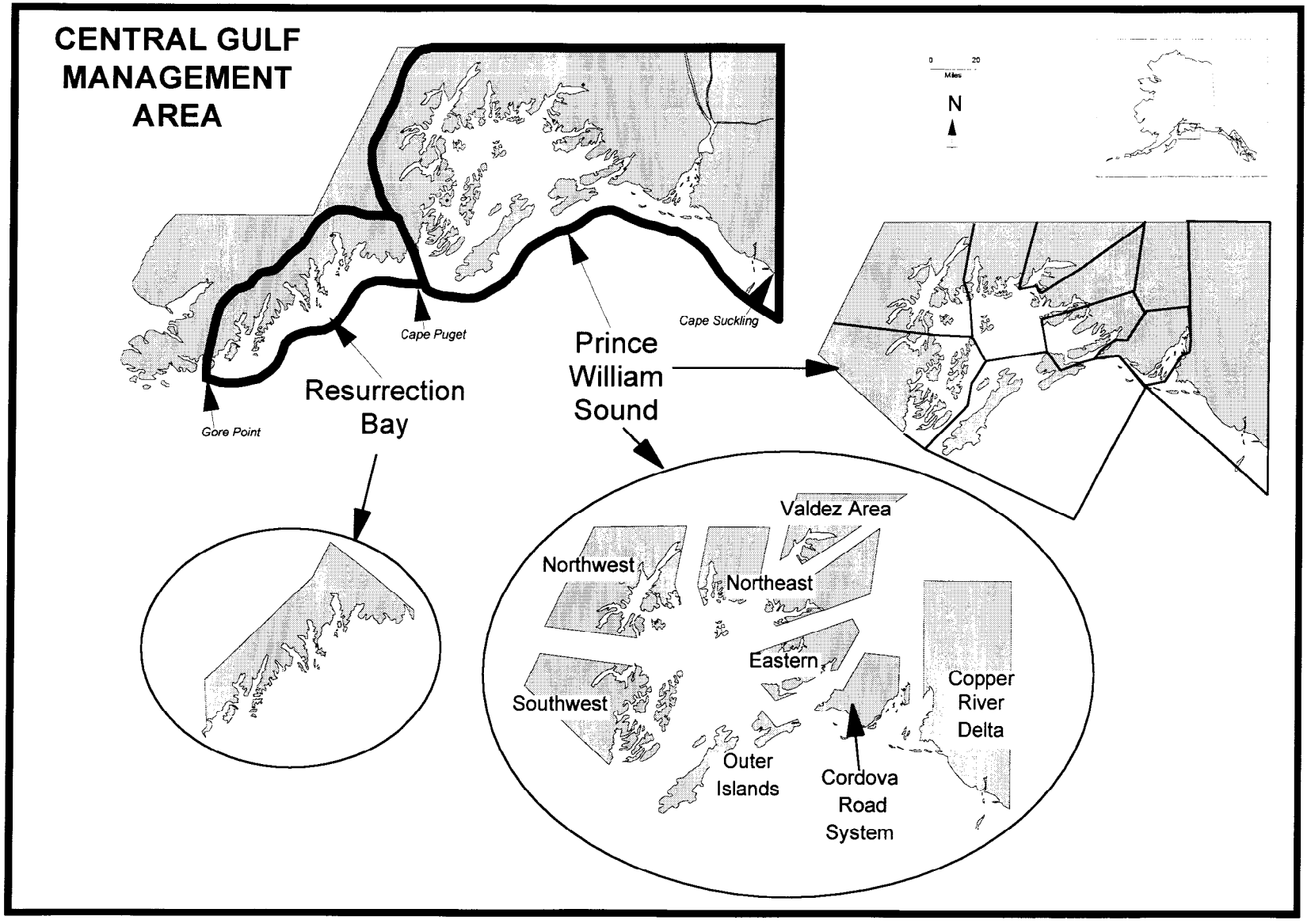


Figure 5.-Map of the geographical regions in the Central Gulf Management Area.

Table 6.-Harvest and effort expended sport fishing in the Valdez area from 1983 through 1994.

YEAR	Freshwater Effort	Saltwater Effort	Total Effort	Harvest											
				King Salmon	Silver Salmon	Pink Salmon	Sockeye Salmon	Chum Salmon	Dolly Varden	Lingcod	Rockfish	Halibut	Arctic Grayling	Eulachon
1983	288	15,764	16,052	241	4,710	8,696	343	976	976	0	3,703	1,846	0	0
1984	4,885	18,720	23,605	125	5,138	9,825	811	1,397	9,566	0	4,402	1,322	0	499
1985	1,735	50,127	51,862	326	8,020	28,450	1,085	1,400	4,803	0	6,304	3,310	0	0
1986	2,425	29,626	32,051	168	6,911	22,170	413	1,865	5,077	0	6,366	3,669	352	15
1987	628	47,546	48,174	360	8,884	27,071	1,756	1,525	1,049	0	3,175	2,185	54	0
1988	1,012	51,096	52,108	227	10,241	26,776	1,582	4,201	983	0	6,983	4,599	182	3,713
1989	1,029	48,471	49,500	526	18,143	32,922	881	2,736	1,141	0	7,072	4,231	58	0
1990	659	71,250	71,909	220	18,630	46,730	1,630	1,258	1,341	0	4,350	6,045	114	3,386
1991	903	67,891	68,794	353	10,393	48,618	1,471	838	1,441	1,122	3,979	6,122	331	0
1992	1,552	59,400	60,952	317	17,580	28,596	2,153	804	1,622	1,476	7,625	8,379	0	379
1993	1,073	52,585	53,658	405	12,841	32,479	1,235	873	1,801	1,117	4,894	8,457	249	1,453
1994	1,599	54,730	56,329	394	18,633	46,494	2,368	767	401	287	5,725	7,457	0	81
1983-1993 MEAN	1,472	46,589	48,060	297	11,045	28,394	1,215	1,625	2,709	338	5,350	4,560	122	859
% CHANGE of 1994 FROM MEAN	9%	17%	17%	33%	69%	64%	95%	-53%	-85%	-15%	7%	64%	-100%	-91%

From: Mills 1984-1994, Howe et al. 1995

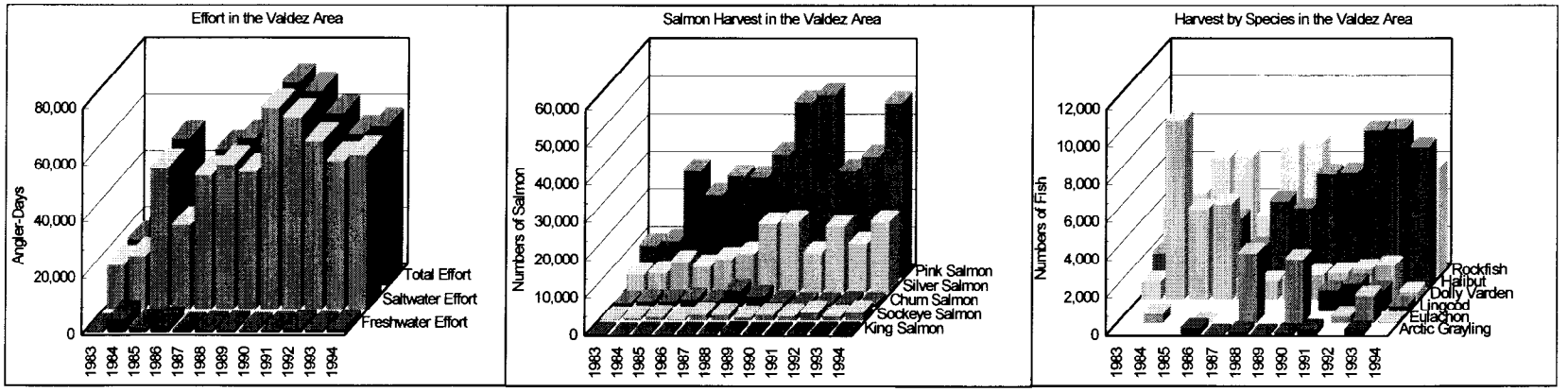


Figure 6.-Harvest and effort expended sport fishing in the Valdez area from 1983 through 1994.

PORT OF CORDOVA FISHERIES

The waters of the Cordova area (Appendix A2) support the second most popular fisheries in PWS in terms of angling effort expended since 1983. These waters on average have accounted for 7% of the angling effort expended in the CGMA (Table 2). On average, approximately 57% of the effort in Cordova is expended in fresh water (Table 7). The 19,401 angler-days expended during 1994 in the Cordova area represent a 79% increase from the historical mean (Table 7 and Figure 7). This increase can probably be attributed to the growing popularity of the Fleming Spit enhancement, trolling for salmon in Orca Inlet, and increased interest in coho salmon fishing along the Cordova road system. Sport fisheries target salmon, bottomfish, Dolly Varden, cutthroat trout, and Arctic grayling. In terms of numbers of fish harvested, the most popular fisheries are those that target coho salmon and Dolly Varden. In terms of angler effort, the coho salmon and cutthroat trout fisheries are most popular.

PORT OF WHITTIER FISHERIES

The waters of the Whittier area (Appendix A3) support the third most popular fisheries in PWS in terms of angling effort expended since 1983. These waters on average have accounted for approximately 8% of the recreational angling effort expended in the CGMA (Table 2). Nearly all of the angling effort is expended in marine waters since there are limited opportunities to fish in fresh water. Sport fisheries target salmon and bottomfish. In 1994, 16,286 angler-days were expended in the Whittier area (northwest PWS) which was a 39% increase from the historical mean. This growth appears to be a result of increased groundfish fisheries as evidenced by a 151% increase in halibut harvest, a 74% increase in rockfish harvest and a 393% increase in lingcod harvest in 1994 over the 10-year mean (Table 8 and Figure 8).

PORT OF SEWARD FISHERIES

The most popular port in the CGMA in terms of fishing effort has been Seward (Appendix A4). The waters accessed through Seward include Resurrection Bay and all coastal waters between Gore Point and Cape Puget. Charter operators often travel as far as Montague Island in PWS. On average the fisheries have accounted for 42% of the recreational angling effort expended in the CGMA (Table 2). The majority of the angling effort is expended in marine waters since there are limited opportunities to fish in fresh water. In 1994, 86,229 angler-days were expended in the marine waters which is 43% higher than the historical mean (Table 9 and Figure 9). Sport fisheries target salmon, bottomfish, and Dolly Varden.

RESURRECTION BAY FISHERIES

Resurrection Bay Coho Salmon Fishery

Resurrection Bay and surrounding marine waters support the largest coho salmon sport fishery in the CGMA. From 1983-1993, the mean harvest of coho salmon from these waters was 22,493 fish, accounting for 55% of the historical mean harvest of coho salmon in CGMA during this period (Table 10 and Figure 10). Most harvest and effort expended on these stocks takes place in marine waters by private boats (Table 11 and Figure 11); however, a growing shore-based fishery targeting these stocks has also developed in recent years. This fishery is highlighted by the 9-day Seward Silver Salmon Derby which has been held each August since 1956. Recognizing the importance of this sport fishery, the Board of Fisheries developed a management plan for the

Table 7.-Harvest and effort expended sport fishing in the Cordova area from 1983 through 1994.

Cordova Road System

YEAR	Freshwater Effort	Saltwater Effort	Total Effort	King Salmon	Silver Salmon	Pink Salmon	Sockeye Salmon	Chum Salmon	Dolly Varden	Lingcod	Rock Fish	Halibut	Arctic Grayling	Cutthroat Trout
1983	6,946	0	6,946	21	2,139	0	1,082	84	2,632	0	0	0	0	1,436
1984	6,574	1,622	8,196	0	2,506	149	112	0	1,245	0	37	237	0	873
1985	1,331	553	1,884	0	564	55	130	0	714	0	380	33	0	188
1986	5,615	2,779	8,394	11	3,440	412	321	15	902	0	145	596	0	901
1987	5,398	5,053	10,451	0	2,351	641	507	0	1,268	0	0	253	0	1,050
1988	2,870	4,124	6,994	9	5,311	364	600	236	1,309	0	169	963	0	218
1989	11,724	5,094	16,818	0	4,248	627	661	64	1,888	0	270	809	116	853
1990	4,526	4,581	9,107	34	3,900	162	466	45	670	0	136	486	0	311
1991	5,271	10,799	16,070	59	4,943	747	806	143	997	157	477	1,463	0	116
1992	9,641	9,581	19,222	321	5,150	37	1,578	38	1,138	177	879	2,305	16	632
1993	7,543	7,400	14,943	302	5,056	433	1,321	170	586	74	335	2,165	0	410
1994	10,705	8,696	19,401	764	5,933	487	3,066	134	611	58	1,215	2,488	28	443
1983-1993 MEAN	6,131	4,690	10,820	69	3,601	330	689	72	1,214	37	257	846	12	635
% CHANGE of 1994 FROM MEAN	75%	85%	79%	1010%	65%	48%	345%	85%	-50%	56%	373%	194%	133%	-30%

From: Mills 1984-1994, Howe et al. 1995

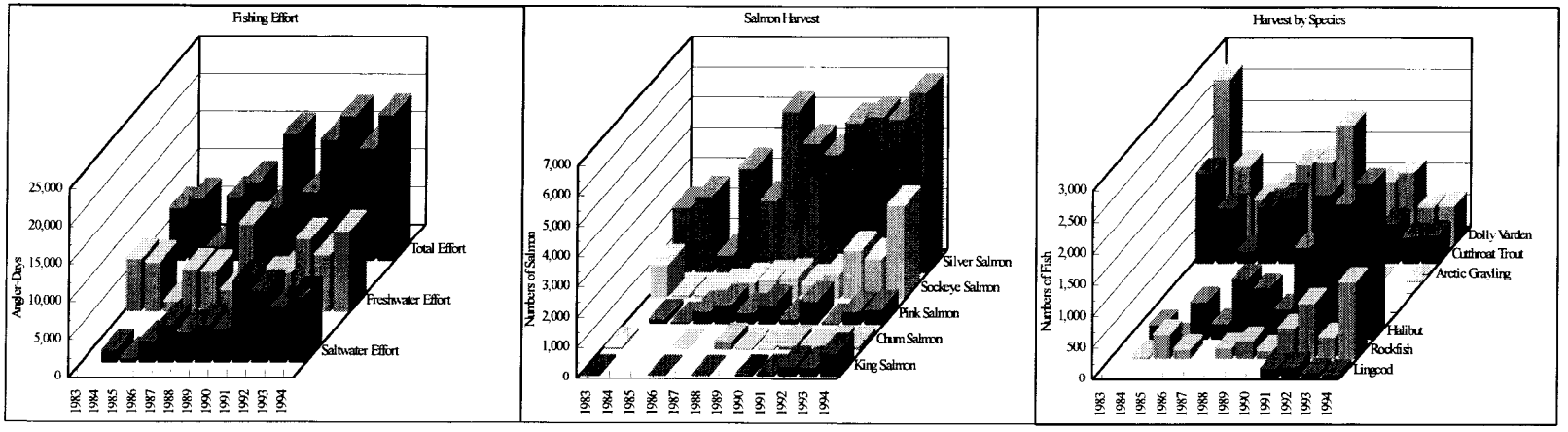


Figure 7.-Harvest and effort expended sport fishing in the Cordova area from 1983 through 1994.

Table 8.-Harvest and effort expended sport fishing in the Whittier area from 1983 through 1994.

YEAR	Freshwater Effort	Saltwater Effort	Total Effort	King Salmon	Silver Salmon	Pink Salmon	Sockeye Salmon	Chum Salmon	Dolly Varden	Lingcod	Rock Fish	Halibut
1983	1,416	6,103	7,519	0	294	2,413	932	31	293	0	1,112	284
1984	1,622	4,501	6,123	212	561	1,422	660	49	299	0	836	387
1985	1,196	9,868	11,064	22	1,725	1,975	759	228	69	0	1,974	826
1986	1,856	12,320	14,176	22	2,981	1,620	2,890	749	688	0	1,810	1,086
1987	3,194	11,834	15,028	321	2,262	2,699	1,884	359	1,593	0	1,971	650
1988	712	13,156	13,868	160	1,600	2,729	728	1,818	73	0	2,371	1,143
1989	823	9,325	10,148	199	1,238	1,681	1,172	257	388	0	2,374	912
1990	835	10,420	11,255	85	2,200	1,033	533	236	262	0	1,398	1,038
1991	255	13,391	13,646	59	2,799	1,647	444	229	40	274	2,497	1,484
1992	329	8,651	8,980	367	640	1,025	1,947	91	89	252	1,483	1,151
1993	341	16,576	16,917	353	1,558	775	1,152	686	213	150	2,158	1,705
1994	337	15,949	16,286	220	2,317	1,335	601	202	108	303	3,158	2,438
1983-1993 MEAN	1,144	10,559	11,702	164	1,623	1,729	1,191	430	364	61	1,817	970
% CHANGE of 1994 FROM MEAN	-71%	51%	39%	34%	43%	-23%	-50%	-53%	-70%	393%	74%	151%

From: Mills 1984-1994, Howe et al. 1995

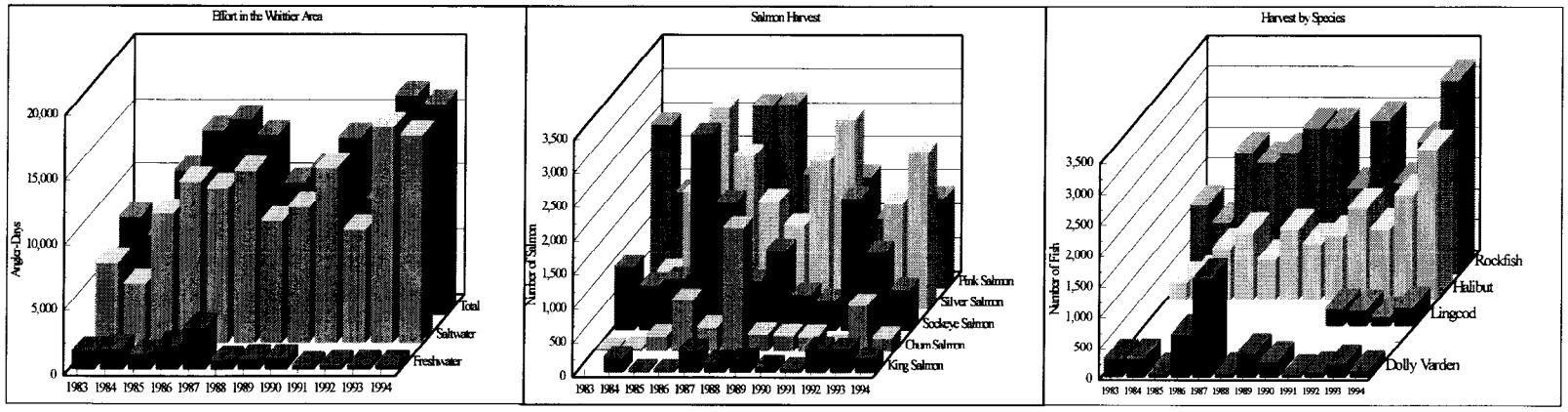


Figure 8.-Harvest and effort expended sport fishing in the Whittier area from 1983 through 1994.

Table 9.-Harvest and effort expended sport fishing in the Resurrection Bay area from 1983 through 1994.

YEAR	Freshwater Effort	Saltwater Effort	Total Effort	King Salmon	Silver Salmon	Pink Salmon	Sockeye Salmon	Chum Salmon	Dolly Varden	Lingcod	Rockfish	Halibut	Eulachon
1983	961	41,189	42,150	199	11,277	4,909	0	923	7,720	0	17,990	2,225	3,672
1984	302	46,376	46,678	24	10,014	11,747	1,372	2,644	1,908	0	22,882	3,242	9,980
1985	225	55,534	55,759	187	11,823	7,202	1,937	820	849	0	17,105	5,934	0
1986	321	55,051	55,372	226	14,502	11,014	337	1,958	1,071	0	38,660	10,398	730
1987	0	44,299	44,299	669	24,985	3,440	851	1,974	924	0	12,768	7,171	31
1988	1,091	51,938	53,029	2,056	17,626	2,001	418	3,947	728	0	35,688	11,696	93
1989	162	50,384	50,546	976	19,392	5,081	872	1,696	1,581	0	24,946	7,290	1,694
1990	254	71,927	72,181	1,004	29,912	6,261	486	427	301	0	18,729	9,500	3,752
1991	340	73,343	73,683	1,547	31,131	4,772	1,051	796	641	6,126	19,803	13,818	563
1992	409	83,159	83,568	2,934	28,356	4,313	1,201	1,321	597	8,081	28,729	18,595	3,753
1993	236	90,038	90,274	5,156	48,409	4,225	1,934	680	987	3,079	24,978	25,551	67
1994	632	86,229	86,861	2,128	38,503	5,573	1,441	695	606	3,712	28,256	25,068	3,839
1983-1993 MEAN	391	60,294	60,685	1,362	22,493	5,906	951	1,562	1,573	1,571	23,843	10,493	2,212
% CHANGE of 1994 FROM MEAN	62%	43%	43%	56%	71%	-6%	52%	-56%	-61%	136%	19%	139%	74%

From: Mills 1984-1994, Howe et al. 1995

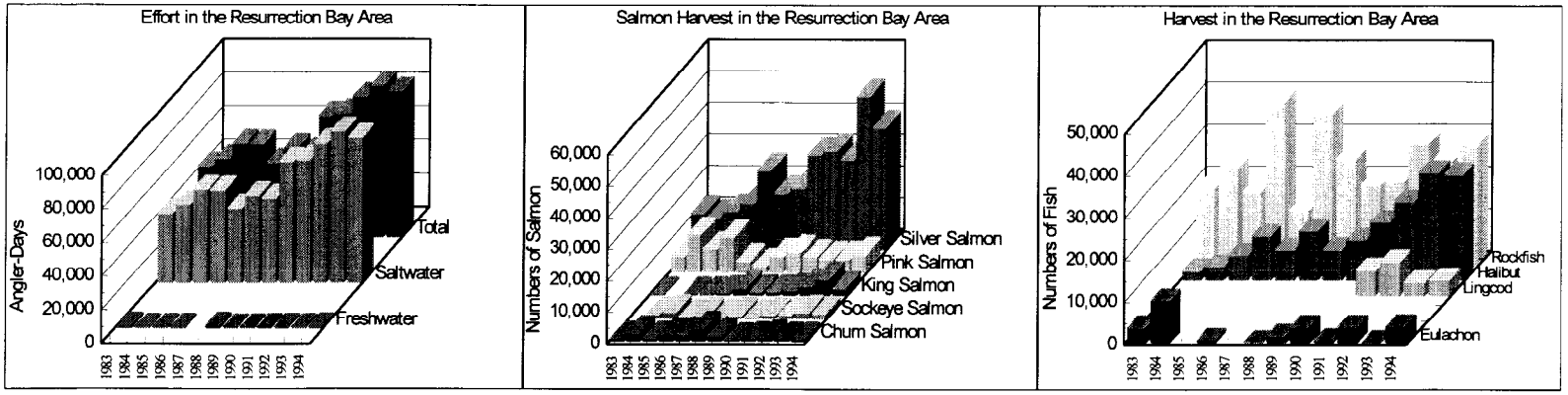


Figure 9.-Harvest and effort expended sport fishing in the Resurrection Bay area from 1983 through 1994.

Table 10.-Summary of coho salmon harvest by geographical regions in the Central Gulf Management Area, 1983-1994.

YEAR	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	0	2,139	94	63	0	294	0	4,710	3,105	10,405	11,277	21,682
1984	274	2,506	212	0	0	561	137	5,138	1,535	10,363	10,014	20,377
1985	315	564	163	98	0	1,725	108	8,020	640	11,633	11,823	23,456
1986	657	3,440	336	397	31	2,981	76	6,911	1,269	16,098	14,502	30,600
1987	640	2,351	903	359	58	2,262	29	8,884	1,194	16,680	24,985	41,665
1988	419	5,311	382	618	0	1,600	54	10,241	637	19,262	17,626	36,888
1989	388	4,248	462	151	0	1,238	245	18,143	756	25,631	19,392	45,023
1990	779	3,900	197	456	35	2,200	147	18,630	295	26,639	29,912	56,551
1991	191	4,943	68	286	170	2,799	103	10,393	830	19,783	31,131	50,914
1992	129	5,150	170	410	219	640	209	17,580	752	25,259	28,356	53,615
1993	1,065	5,056	78	276	153	1,558	107	12,841	659	21,793	48,409	70,202
1994	445	5,933	266	758	65	2,317	258	18,633	1,898	30,573	38,503	69,076
1983-1993 MEAN	442	3,601	279	283	61	1,623	110	11,045	1,061	18,504	22,493	40,998
% CHANGE of 1994 FROM MEAN	1%	65%	-5%	168%	7%	43%	134%	69%	79%	65%	71%	68%

From: Mills 1984-1994, Howe et al. 1995

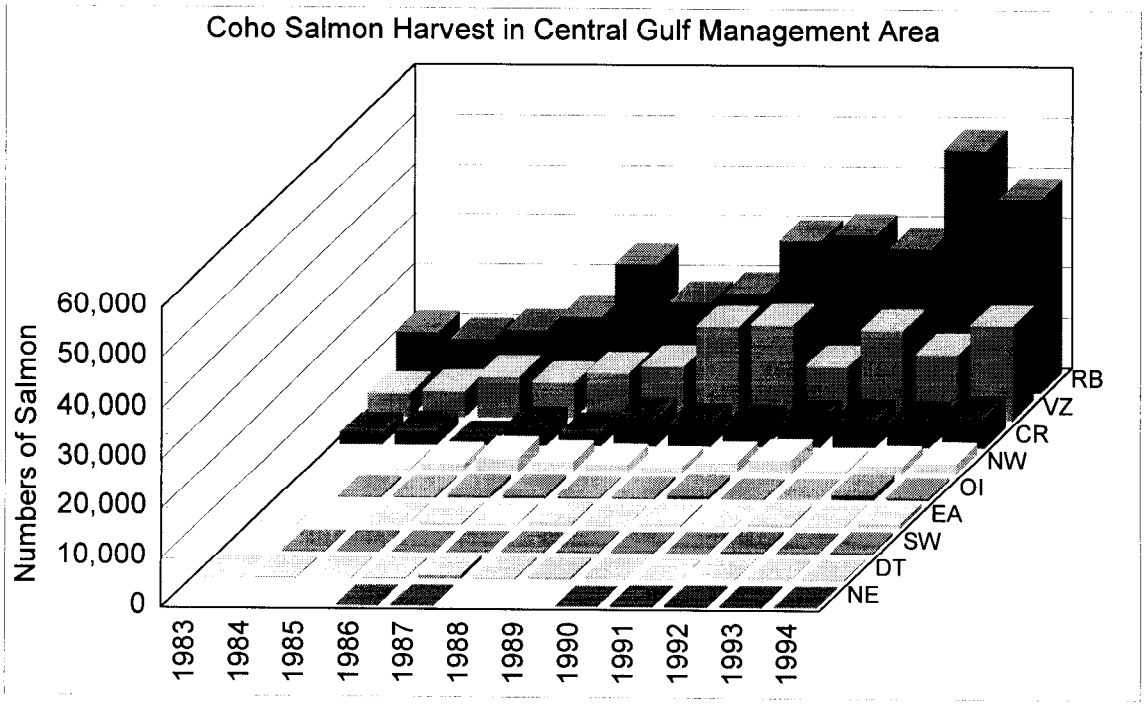


Figure 10.-Summary of coho salmon harvest by geographical regions in the Central Gulf Management Area, 1983-1994.

Table 11.-Sport harvest of coho salmon in Resurrection Bay, 1983-1994.

YEAR	Freshwater	Saltwater Boat Private	Saltwater Shore Private	Saltwater Boat Charter	Total
1983	0	11,277	0	0	11,277
1984	0	9,952	62	0	10,014
1985	87	11,227	509	0	11,823
1986	84	8,364	3,929	2,125	14,502
1987	0	16,958	5,818	2,209	24,985
1988	0	9,932	6,221	1,473	17,626
1989	48	13,444	3,011	2,889	19,392
1990	7	16,703	5,715	7,487	29,912
1991	88	18,452	5,248	7,343	31,131
1992	0	16,259	6,705	5,392	28,356
1993	210	27,581	7,685	12,933	48,409
1994	38	21,248	10,840	6,377	38,503
1983-1993 MEAN	48	14,559	4,082	3,805	22,493
% CHANGE of 1994 FROM MEAN	-20%	46%	166%	68%	71%

From: Mills 1984-1994, Howe et al. 1995

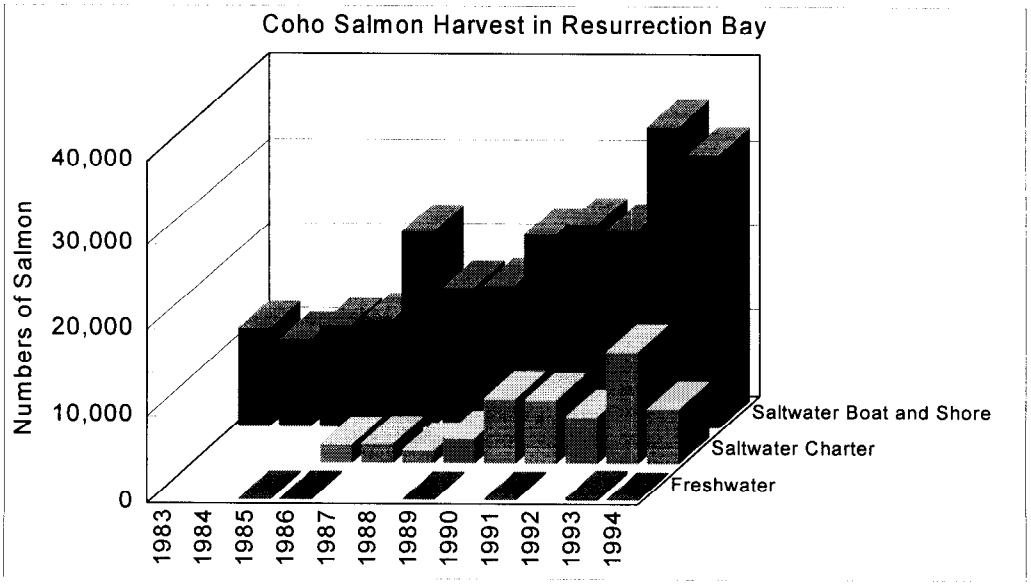


Figure 11.-Sport harvest of coho salmon in Resurrection Bay, 1983-1994.

salmon fisheries in Resurrection Bay in 1966 which gave the sport fishery the exclusive use of the Bay's coho salmon. In 1976, the Board modified the plan to stipulate that the commercial fishery for other salmon species be managed so that it does not interfere with the recreational fishery.

An ongoing enhancement program was initiated in 1964 in Bear Lake, which flows into Resurrection Bay, to supplement wild stock production of coho salmon. The enhancement program included stocking hatchery-reared coho fingerlings and eradicating major competitors. Initial results of the program resulted in increased smolt production (Vincent-Lang 1987). However, the lake gradually became reinfested with competitor species and the lake was again rehabilitated in 1971. Subsequently, survival of stocked fingerlings to smolt in some years has exceeded 50%. This, coupled with correspondingly high adult survival rates, has increased harvests in the recreational fishery. Recognizing the importance of the contribution of this enhancement program to the sport fishery, the Board of Fisheries adopted a management plan for Bear Lake in 1971. This plan stated that Bear Lake be managed primarily for the production of coho salmon and, in accordance with this objective, placed restrictions on the number of sockeye salmon that could be passed into Bear Lake.

In 1988, the Board revised the management plan for Bear Lake. The revised plan allowed for lifting the restrictions placed on the numbers of sockeye salmon which could be passed into the lake and allowed for the enhancement of sockeye salmon in Bear Lake. The purpose of this change in the management plan was to allow for the development of a commercial sockeye salmon fishery in Resurrection Bay. Bear Lake was considered to be the only viable location for such enhancement in the Resurrection Bay area. In making this change, however, the Board recognized the importance of Bear Lake in producing coho salmon for the recreational fishery and stipulated that (1) any enhancement of sockeye salmon must not cause a net loss of coho salmon smolt production from Bear Lake and (2) that any commercial fishery developed as a result of this enhancement effort must be prosecuted with minimal conflict with the recreational fishery. With this change, the Cook Inlet Aquaculture Association took over control of the Bear Lake weir and its operations in 1989, which had been operated by the Division of Sport Fish since the early 1960s.

Another component of the coho salmon enhancement in Resurrection Bay began in 1969 with annual plants of hatchery-reared smolts at a variety of local release sites. Although survival rates have varied between sites and years, smolt-to-adult survivals have been as high as 15%. The contribution of these fish to the sport fishery has also been significant, up to 51% (Vincent-Lang 1987; Vincent-Lang et al. 1988; Carlon and Vincent-Lang 1989, 1990).

The current bag and possession limits for salmon other than chinook salmon in Resurrection Bay are six fish per day and in possession. All freshwater drainages of Resurrection Bay are closed to salmon fishing.

Recent Fishery Performance

The sport harvest of coho salmon from Resurrection Bay waters during 1994 (38,503) was 71% above the historical mean harvest for the area since 1983 (Table 11 and Figure 11). This harvest accounted for just over 55% of the total coho salmon harvest from CGMA waters during 1994. As was the case in the past, private boat and shore anglers accounted for the largest portion of the sport harvest (83%).

Management Objective
For coho salmon smolt releases, the management objectives are to: (1) produce, through supplemental hatchery production, an annual return of 9,000 coho salmon; (2) provide 18,000 angler-days of fishing opportunity annually; and (3) promote diverse sport fishing opportunity by providing coho salmon to both boat and shore-based anglers.

Cook Inlet Aquaculture Association is projecting a return of over 100,000 sockeye salmon to Bear Lake in 1996. This return is large enough to initiate a sockeye salmon fishery in Resurrection Bay and to provide fish for brood source for future Bear Lake releases and cost recovery for the stocking program. By regulation, any commercial fishery that occurs must be prosecuted with seine gear and all coho and chinook salmon caught incidentally must be released immediately. Also, this fishery must be prosecuted in a manner to minimize conflict with the recreational fishery.

No escapement goals have been established for coho salmon returns in Resurrection Bay. The escapement goal for sockeye salmon to Bear Lake is 1,000 fish.

No other specific fishery objectives have been formally established for Resurrection Bay coho salmon fisheries to date other than management objectives outlined in the Bear Lake and Resurrection Bay Management Plans. An assumption of past and current fisheries management, however, has been to assure the sustained yield of the various wild coho salmon stocks that occur within the CGMA while assuring continued and, where possible, expanded opportunity to participate in hatchery-supported coho salmon recreational fisheries in the area.

Recent Board of Fisheries Actions
There were no regulatory actions in this fishery during 1992. The next meeting for this area is scheduled for the fall of 1996.

During its 1992 meeting, the Board entertained several proposals regarding the management of Resurrection Bay commercial fisheries. These proposals centered on reintroducing gill net gear to the commercial fishery in anticipation of the sockeye salmon return from the Bear Lake enhancement effort. The Board failed to enact any changes to the current management plans for Bear Lake or Resurrection Bay.

During the 1992 meeting, the BOF voted against a proposal suggested by United Cook Inlet Drift Association to reinstitute drift gill nets in Resurrection Bay. There was very little discussion before the vote. All but one of the peninsula advisory committees voted against the proposal.

Current Issues
The only major issue with this fishery is how the developing commercial fishery on sockeye salmon returning to Bear Lake will impact the recreational fishery. This issue will be addressed in the section entitled "Resurrection Bay Sockeye Salmon Fishery."

Ongoing Research and Management Activities
There are no other ongoing research and management activities to report for this fishery.

Recommended Research and Management Activities
No research activities for this fishery are recommended at present.

Resurrection Bay Chinook Salmon Fishery

Resurrection Bay does not support any natural (wild) returns of chinook salmon that can sustain directed sport harvest. Thus the sport fishery for chinook salmon in and near Resurrection Bay is supported primarily by hatchery-produced fish with a limited harvest of wild feeder chinook salmon. Chinook salmon smolt with early run timing (May and June) have been stocked in the marine waters adjacent to Lowell Creek and in Seward Lagoon since 1984. These releases have averaged approximately 225,000 smolts since 1988 (Table 5). Starting in 1991, chinook salmon smolt with late-run timing (July) were also stocked in Seward. These releases were intended to diversify and extend fishing opportunities in Resurrection Bay.

The marine waters of Resurrection Bay are open to the taking of chinook salmon throughout the year. The bag and possession limit for chinook salmon in marine waters is two fish per day and two fish in possession. All freshwater drainages of Resurrection Bay are closed to salmon fishing.

From 1983-1993, the mean harvest of chinook salmon from marine waters of Resurrection Bay has been 1,362 fish, accounting for 66% of the historical mean harvest of chinook salmon in CGMA over this period (Table 12 and Figure 12).

Recent Fishery Performance

The sport harvest of chinook salmon in Resurrection Bay during 1994 (2,128) was 56% above the historical mean harvest for the area since 1983 (Table 13 and Figure 13). Anglers fishing from the shoreline accounted for the largest proportion of the harvest followed by the private boat anglers. The chinook harvest from shore anglers increased 84% from the historical mean.

Management Objective

For hatchery-produced early-run chinook salmon, the management objectives are to: (1) produce, through supplemental hatchery production, an annual return of 6,000 early-run chinook salmon; (2) provide 9,000 angler-days of early-run chinook salmon fishing opportunity annually; and (3) promote diverse sport fishing opportunity by providing early-run chinook salmon to both boat and shore-based anglers.

For hatchery-produced late-run chinook salmon the management objectives are to: (1) produce, through supplemental hatchery production, an annual return of 3,000 late-run chinook salmon; (2) provide 9,000 angler-days of late-run chinook salmon fishing opportunity annually; and (3) promote diverse sport fishing opportunity by providing late-run chinook salmon to both boat and shore-based anglers.

Recent Board of Fisheries Actions

There were no Board actions for this fishery in 1990 or 1992.

Current Issues

In order to meet the objectives stated above (participation and diversity for both shore and boat anglers), it will be necessary to continue to work with local charter operators and private boat owners to establish a troll fishery on returning adult chinook salmon. A troll fishery would

Table 12.-Summary of chinook salmon harvest by geographical regions in the Central Gulf Management Area, 1983-1994.

YEAR	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	0	21	0	0	0	0	0	241	314	576	199	775
1984	0	0	0	0	0	212	0	125	74	411	24	435
1985	0	0	0	0	0	22	0	326	0	348	187	535
1986	0	11	0	234	0	22	0	168	67	502	226	728
1987	0	0	0	165	0	321	0	360	19	865	669	1,534
1988	0	9	0	0	0	160	9	227	38	443	2,056	2,499
1989	210	0	0	0	0	199	117	526	41	1,093	976	2,069
1990	56	34	0	23	0	85	0	220	0	418	1,004	1,422
1991	0	59	0	0	0	59	6	353	0	477	1,547	2,024
1992	47	321	0	0	0	367	23	317	41	1,116	2,934	4,050
1993	47	302	47	18	9	353	0	405	163	1,344	5,156	6,500
1994	0	764	0	29	0	220	0	394	317	1,724	2,128	3,852
1983-1993 MEAN	33	69	4	40	1	164	14	297	69	690	1,362	2,052
% CHANGE of 1994 FROM MEAN	-100%	1010%		-28%		34%	-100%	33%	361%	150%	56%	88%

From: Mills 1984-1994, Howe et al. 1995

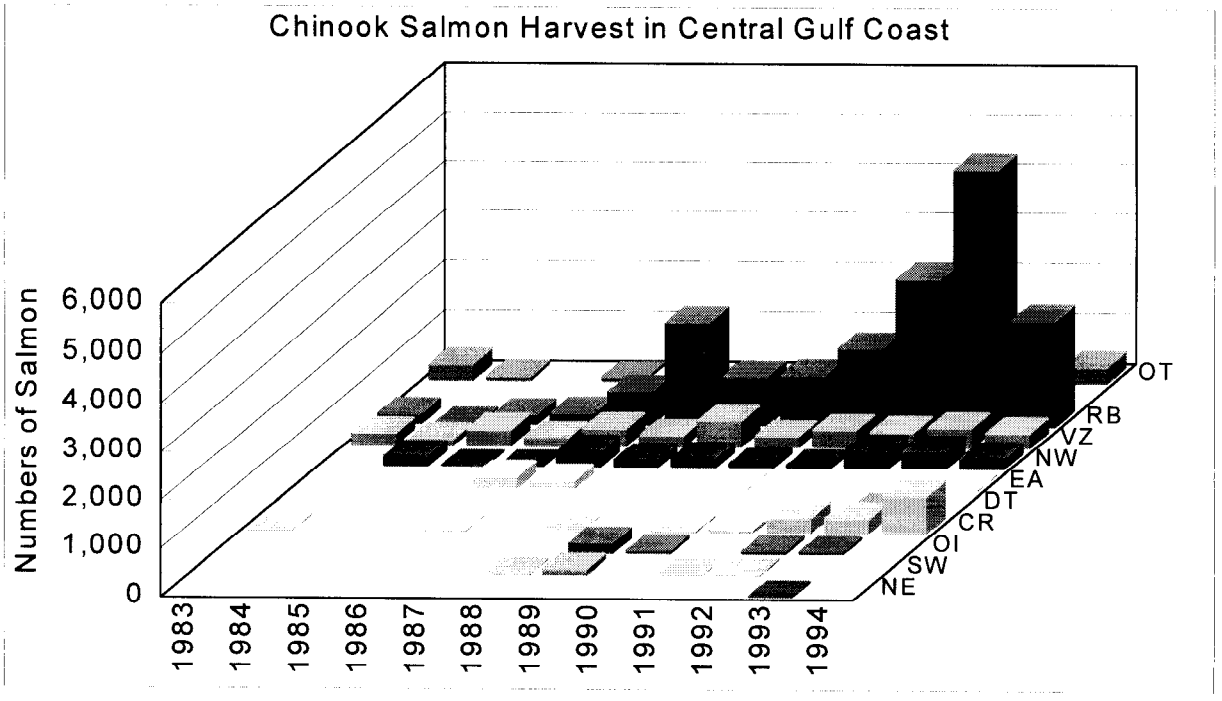


Figure 12.-Summary of chinook salmon harvest by geographical regions in the Central Gulf Management Area, 1983-1994.

Table 13.-Sport harvest of chinook salmon in Resurrection Bay, 1983-1994.

YEAR	Freshwater	Saltwater Boat Private	Saltwater Shore Private	Saltwater Total (B+S) Private	Saltwater Charter	Grand Total
1983	0	199	0	199	0	199
1984	0	24	0	24	0	24
1985	0	187	0	187	0	187
1986	0	129	97	213	13	226
1987	0	344	325	452	217	669
1988	0	891	1,165	1,820	236	2,056
1989	0	518	458	829	147	976
1990	0	594	410	942	62	1,004
1991	0	778	769	1,189	358	1,547
1992	0	1,557	1,377	2,605	329	2,934
1993	0	2,001	3,155	4,464	692	5,156
1994	50	782	1,296	1,730	348	2,128
1983-1993 MEAN		657	705	1,175	187	1,362
% CHANGE of 1994 FROM MEAN		19%	84%	47%	86%	56%

From: Mills 1984-1994, Howe et al. 1995

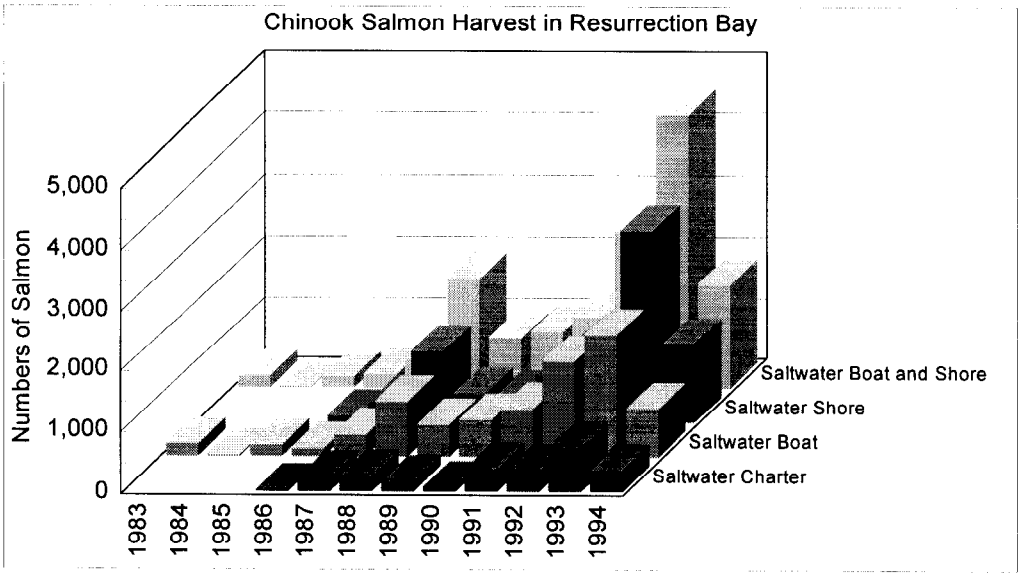


Figure 13.-Sport harvest of chinook salmon in Resurrection Bay, 1983-1994.

distribute the effort and catch between angler groups. In the early '90s, the majority of the catch came from shoreline anglers although the percent of harvest from private boats increased significantly in 1993. As anticipated, as anglers became more familiar with this resource and the numbers of returning adult chinook increased, the effort increased in the boat fishery, In 1995 the early run was primarily a shore fishery, but the late run peaked in mid-August during the salmon derby and harvests were split evenly between the shore anglers and the boat anglers.

Ongoing Research and Management Activities
There are no ongoing research or management activities for this fishery.

Recommended Research and Management Activities
No new research activities or regulation changes for this fishery are recommended at present.

Resurrection Bay Pink Salmon Fishery

The Resurrection Bay pink salmon fishery is supported by wild stocks that spawn in five streams at the head of the bay. Pink salmon return to Resurrection Bay mid-July through late August with the peak of the return occurring in late July.

The sport fishing season is open all year and the bag and possession limit is six salmon other than chinook per day and six in possession.

The average harvest of pink salmon in Resurrection Bay has been 5,906 fish from 1983 through 1993 which accounted for an average of 15% of the total CGMA pink salmon harvest over this period (Table 14 and Figure 14).

Recent Fishery Performance
The sport harvest of pink salmon from Resurrection Bay during 1993 (5,573) was 6% below the historical mean harvest for the area (Table 14 and Figure 14). This harvest accounted for about 10% of the total pink salmon harvest from CGMA waters during 1994. Private boat anglers harvested the largest proportion of the total harvest, followed by shoreline anglers and charter boat anglers (Table 15 and Figure 15).

Management Objective
No specific fishery objectives have been formally established for Resurrection Bay pink salmon fisheries to date. An assumption of past and current fisheries management, however, has been to assure the sustained yield of the various pink salmon stocks that occur within the area while assuring continued and, where possible, expanded opportunity to participate in fisheries targeting these stocks.

Recent Board of Fisheries Actions
There were no Board actions regarding this fishery in 1990 or 1992.

Current Issues
There are currently no issues regarding this fishery.

Ongoing Research and Management Activities
The Division of Sport Fish does not conduct any research on pink salmon stocks in Resurrection Bay but the Division of Commercial Fisheries conducts aerial escapement surveys of pink salmon in the lower Cook Inlet area including Resurrection Bay.

Table 14.-Summary of pink salmon harvest by geographical regions in Central Gulf Management Area, 1983-1994.

YEAR	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	0	0	0	0	0	2,413	157	8,696	3,430	14,696	4,909	19,605
1984	424	149	0	0	0	1,422	499	9,825	2,169	14,488	11,747	26,235
1985	108	55	0	54	65	1,975	195	28,450	1,768	32,670	7,202	39,872
1986	91	412	92	443	0	1,620	291	22,170	153	25,272	11,014	36,286
1987	87	641	117	19	146	2,699	233	27,071	369	31,382	3,440	34,822
1988	36	364	0	36	0	2,729	746	26,776	783	31,470	2,001	33,471
1989	69	627	155	498	454	1,681	962	32,922	626	37,994	5,081	43,075
1990	232	162	12	0	221	1,033	570	46,730	186	49,146	6,261	55,407
1991	27	747	9	324	288	1,647	171	48,618	459	52,290	4,772	57,062
1992	9	37	9	18	540	1,025	202	28,596	1,575	32,011	4,313	36,324
1993	26	433	29	220	0	775	191	32,479	1,582	35,735	4,225	39,960
1994	171	487	0	128	189	1,335	272	46,494	2,462	51,538	5,573	57,111
1983-1993 MEAN	101	330	38	147	156	1,729	383	28,394	1,191	32,469	5,906	38,374
% CHANGE of 1994 FROM MEAN	70%	48%	-100%	-13%	21%	-23%	-29%	64%	107%	59%	-6%	49%

From: Mills 1984-1994, Howe et al. 1995

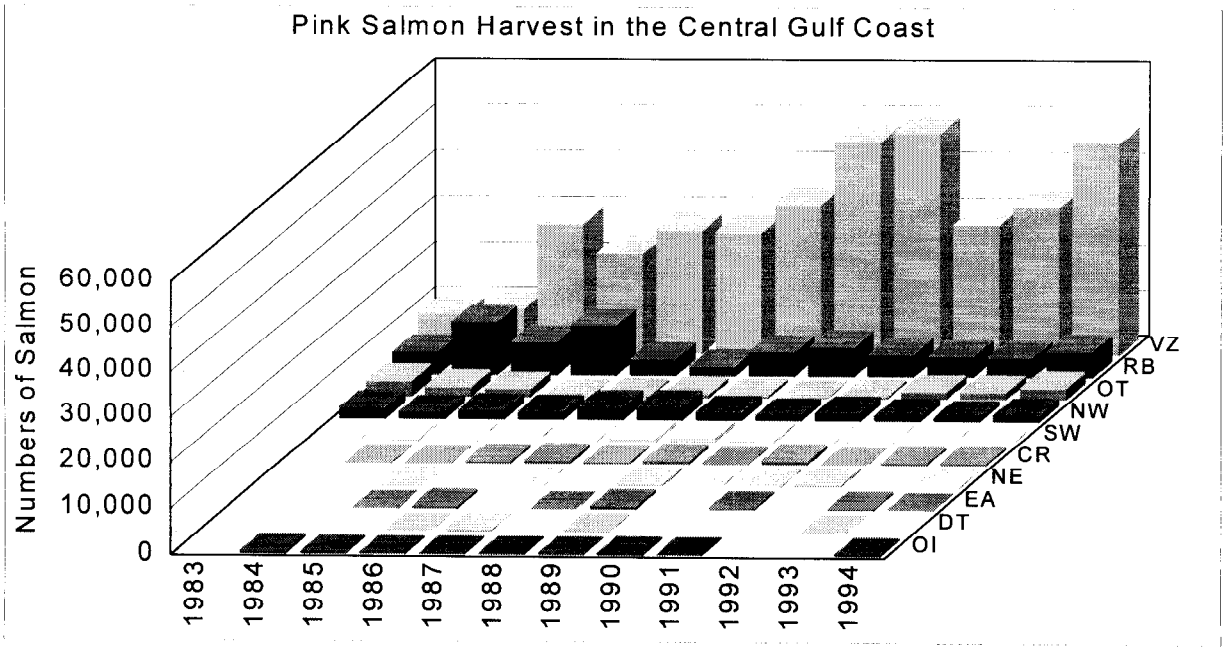


Figure 14.-Summary of pink salmon harvest by geographical regions in Central Gulf Management Area, 1983-1994.

Table 15.-Sport harvest of pink salmon in Resurrection Bay, 1983-1994.

YEAR	Freshwater	Saltwater Boat Private	Saltwater Shore Private	Saltwater Total (B+S) Private	Saltwater Charter	Grand Total
1983	0	4,909	0	4,909	0	4,909
1984	150	11,510	87	11,597	0	11,747
1985	0	5,262	1,940	7,202	0	7,202
1986	0	4,449	6,559	8,470	2,538	11,014
1987	0	1,974	1,466	1,937	1,503	3,440
1988	0	1,601	400	1,655	346	2,001
1989	0	1,659	3,422	4,524	557	5,081
1990	0	4,170	2,091	5,234	1,027	6,261
1991	0	2,745	2,027	3,615	1,157	4,772
1992	0	2,408	1,905	3,389	924	4,313
1993	0	2,741	1,484	3,359	866	4,225
1994	0	2,157	3,416	4,916	657	5,573
1983-1993 MEAN		3,948	1,944	5,081	811	5,906
% CHANGE of 1994 FROM MEAN		-45%	76%	-3%	-19%	-6%

From: Mills 1984-1994, Howe et al. 1995

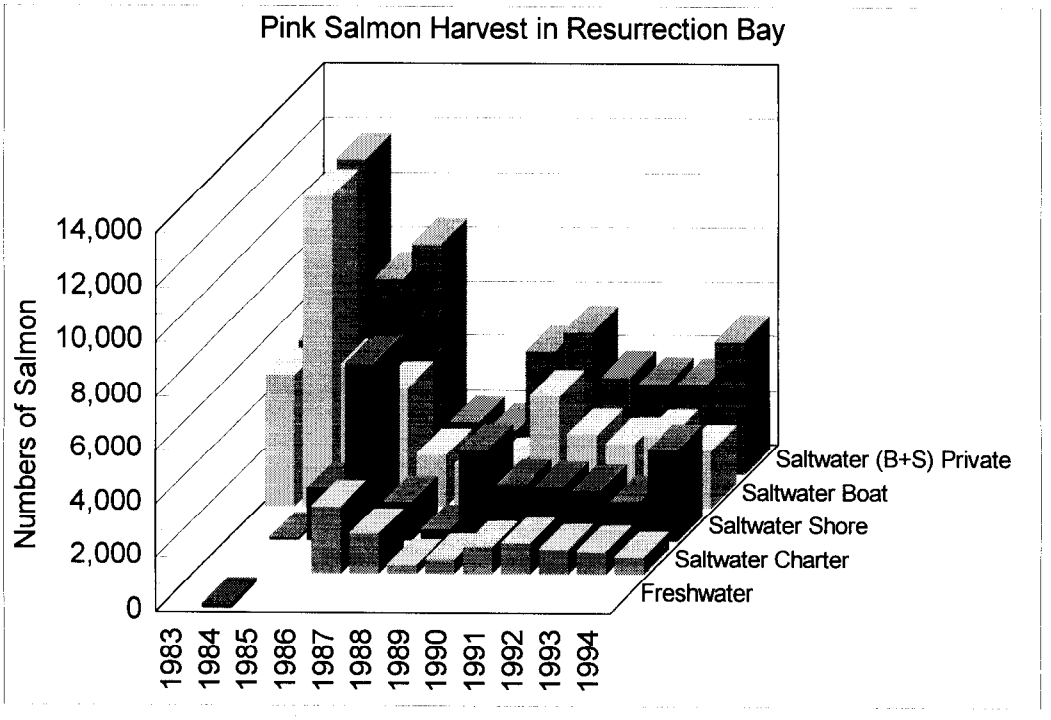


Figure 15.-Sport harvest of pink salmon in Resurrection Bay, 1983-1994.

Recommended Research and Management Activities

No additional research or management activities are recommended for this fishery at present. At this time, no changes in regulations are recommended with respect to this fishery.

Resurrection Bay Sockeye Salmon Fishery

Sockeye salmon return to Resurrection Bay streams from June through July with peak immigration varying by stream. Spawning occurs in mid-July through September.

Current limits governing the sport fishery for salmon other than chinook in marine waters are six per day and in possession. Salmon fishing in Resurrection Bay drainages is closed.

Resurrection Bay has historically been managed primarily for the recreational coho salmon fishery. The sport harvest of sockeye salmon has been incidental and has targeted Bear Lake sockeye stocks. The Board of Fisheries developed a management plan for the salmon fisheries in Resurrection Bay in 1966 which gave the sport fishery the exclusive use of the Bay's coho salmon. In 1976 the Board modified the plan to stipulate that the commercial fishery for other salmon species be managed so that it does not interfere with the recreational fishery. After a successful coho salmon enhancement program was established in Bear Lake, the Board of Fisheries adopted a management plan for Bear Lake in 1971. This plan stated that Bear Lake be managed primarily for the production of coho salmon and, in accordance with this objective, placed restrictions on the number of sockeye salmon entering Bear Lake.

Bear Lake is considered the only viable candidate for sockeye salmon enhancement in Resurrection Bay. The Board adopted a new management plan for Bear Lake in 1988. This plan rescinded the restrictions on the escapement of sockeye salmon to Bear Lake. Sockeye salmon dip net fisheries were no longer permitted in Bear Creek. The plan further directed the department to establish a sockeye salmon escapement goal for Bear Lake. The plan also stipulated that if enhancement of sockeye salmon occurs, the early run timing of the native stock is to be maintained. The Board further specified that enhancement should not cause a net loss of coho smolt production from Bear Lake. Should enhancement of sockeye salmon create a viable commercial fishery, it was the Board's intent that this fishery be conducted "with minimal conflict with the sport fishery." This plan was a major departure from previous policy in that Bear Lake is now managed for both coho and sockeye salmon production.

In the spring of 1990, 2.24 million early-run sockeye salmon fry of Big River origin were released into Bear Lake. In addition, 159,000 age-0 smolt of Russian River early-run origin were released in Bear Creek (Table 5). These smolt contributed to the first sockeye salmon returns in 1992. The first significant return from the 1990 fry release occurred in 1994 when fish returned as 2-ocean adults.

From 1983 through 1993, the average harvest of sockeye salmon from Resurrection Bay was 951 fish. About 63% of this harvest has been from boat anglers and the rest from shore anglers fishing in saltwater (Table 16 and Figure 16). Chartered anglers account for 12% of this average harvest.

Recent Fishery Performance

The sport harvest of sockeye salmon from Resurrection Bay during 1994 (1,441) was 52% above the historical mean harvest for the area since 1983 (Table 16 and Figure 16). In 1994 there was a

Table 16.-Sport harvest of sockeye salmon in Resurrection Bay, 1983-1994.

YEAR	Freshwater	Saltwater Boat Private	Saltwater Shore Private	Saltwater Total (B+S)	Saltwater Boat Charter	Saltwater Boat Total	Grand Total
1983	0	0	0	0	0	0	0
1984	67	1,305	0	1,305	0	1,305	1,372
1985	0	1,335	602	1,937	0	1,335	1,937
1986	0	123	214	306	31	154	337
1987	0	308	543	760	91	399	851
1988	0	254	164	400	18	272	418
1989	0	367	505	744	128	495	872
1990	0	398	88	418	68	466	486
1991	51	464	536	744	256	720	1,051
1992	0	675	526	1,143	58	733	1,201
1993	39	1,383	512	1,679	216	1,599	1,934
1994	26	714	701	1,007	408	1,122	1,441
1983-1993 MEAN	14	601	335	858	79	680	951
% CHANGE of 1994 FROM MEAN	82%	19%	109%	17%	418%	65%	52%

From: Mills 1984-1994, Howe et al. 1995

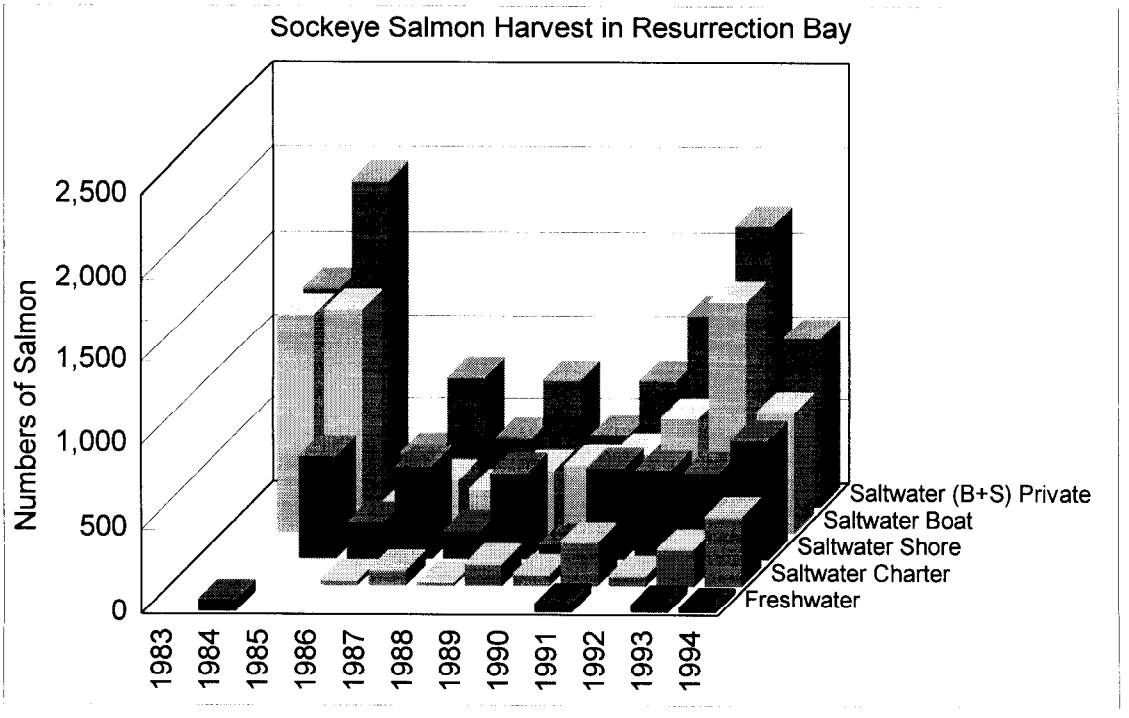


Figure 16.-Sport harvest of sockeye salmon in Resurrection Bay, 1983-1994.

drop in harvest of sockeye from boat anglers, however the portion of the boat harvest coming from chartered anglers was significantly higher than in previous years.

Management Objective
A biological escapement goal of 1,000 sockeye salmon has been established for Bear Lake. No other specific fishery objectives have been formally established for Resurrection Bay sockeye salmon fisheries to date other than management objectives outlined in the Bear Lake and Resurrection Bay Management Plans. An assumption of past and current fisheries management, however, has been to assure the sustained yield of the wild sockeye salmon stocks that occur within the CGMA while assuring continued and, where possible, expanded opportunity to participate in hatchery-supported sockeye salmon fisheries in the area.

Recent Board of Fisheries Actions
No specific actions were taken by the Board with respect to this fishery during its 1992 meetings.

During its 1992 meeting, the Board entertained a proposal regarding the management of Resurrection Bay commercial fisheries. The proposal centered on reintroducing gill net gear to the commercial fishery in anticipation of the sockeye salmon return from the Bear Lake enhancement effort. The Board did not pass this proposal and did not want to enact any changes to the current management plans for Bear Lake or Resurrection Bay.

Current Issues
In anticipation of an enhanced sockeye salmon return to Bear Lake in 1992, the Division of Commercial Fisheries and the Cook Inlet Seiners Association jointly developed a management plan that will attempt to provide adequate escapement while still allowing an orderly commercial harvest of surplus fish. The plan calls for the commercial fishery to operate on the capes outside of Resurrection Bay to minimize the impact on the recreational fishery. There is no information available on the likely entry pattern for sockeye salmon returning to Bear Lake, and staff have concerns about creating a mixed-stock fishery on the capes. The Lower Cook Inlet Seine Fishery Management Plan stipulates that all seine fisheries conducted in Lower Cook Inlet be managed so that their efforts are directed primarily on Lower Cook Inlet stocks. If a significant mixed-stock fishery on other stocks develops as a result of this interim management, the cape fishery can be closed under this plan.

Ongoing Research and Management Activities
No specific research or management activities are directed at this fishery by Division of Sport Fish.

Recommended Research and Management Activities
It is imperative that a department-approved coded wire tagging and recovery program be conducted for the Bear Lake sockeye salmon program. This program will provide data on fishery contribution, timing, and success of the smolt and fry releases of sockeye salmon from Bear Lake.

PRINCE WILLIAM SOUND FISHERIES

Prince William Sound Coho Salmon Fishery

The coho salmon fisheries in PWS are supported by both wild and hatchery fish, although the majority of the harvest is hatchery fish. Coho salmon smolt have been stocked at Valdez,

Cordova, and Whittier and returns from these stocking efforts have established major sport fisheries at all three locations.

Wild and stocked coho salmon return to PWS streams from mid-August through October. Peak immigration typically occurs during mid-September and spawning occurs in streams beginning in October.

The majority of PWS is open to the taking of coho salmon year-round. The bag and possession limit for coho in marine waters is six fish per day and 12 fish in possession and three fish per day and in possession in fresh water. There are some waters that are not open to coho salmon fishing. These waters include Eccles Creek, Eyak Lake, and Hartney Creek (all near Cordova), and all freshwater drainages of Valdez Arm except for Robe River and Solomon Gulch Creek.

From 1983-1993, the mean harvest of coho salmon from PWS has been 18,505 accounting for 45% of the historical mean harvest of coho salmon in the CGMA during this period (Table 10 and Figure 10). Nearly 60% of this harvest has been from Valdez Arm (Table 10 and Figure 10). Since 1988, the majority of the harvest of coho salmon in Valdez Arm has been from fish produced by the nonprofit Valdez Fisheries Development Association hatchery located on Solomon Gulch Creek. Coho sport fishing in Port Valdez takes place from boats and the shoreline since by regulation most of the freshwater drainages of Port Valdez are closed to fishing for salmon.

The Cordova road system is another popular coho fishery in PWS. Anglers fishing this area have accounted for 19% of the PWS historical mean harvest from 1983-1993 (Tables 10 and 17, Figure 17). As in Port Valdez, the sport harvest of coho salmon is comprised of both wild and hatchery fish. The wild stock component of the harvest is taken from the clearwater tributaries accessible from the Copper River Highway between Eyak River and the Million Dollar Bridge. Eyak River is the most popular fishing location for coho salmon along the Cordova road system and has accounted for 44% of the historical mean harvest (Table 17 and Figure 17). The next largest coho salmon fishery targets hatchery coho salmon returning to Fleming Spit in Orca Inlet, located near downtown Cordova. Anglers harvested an average of approximately 1,047 coho, between 1983-1993, from waters adjacent to Fleming Spit. Another popular coho fishery occurs along the highway in the clearwater streams entering Alaganik Slough.

The Whittier area sport fishery (Northwest PWS) for coho salmon depends entirely on returning hatchery fish. The coho salmon smolt release program has produced annual returns that have ranged from approximately 50 to 4,000 adult coho. Since the adult returns have been highly variable, the sport harvest has also fluctuated. The harvest has ranged from 294 to 2,981 coho salmon from 1983-1993 (see NW PWS, Table 10 and Figure 10). This fishery takes place in and around the Whittier boat harbor, near the mouths of Shakespeare and Cove creeks. Both shoreline and boat anglers participate in this fishery.

The remainder of the PWS harvest of coho salmon comes from sites other than the three major ports (Table 10 and Figure 10). These fisheries occur primarily on wild stocks of coho salmon throughout the non-road-accessible areas of PWS, although there is a growing fishery that targets coho returning to PWSAC's Wally Noerenberg Hatchery located at the southern end of Esther Island.

Table 17.-Summary of coho salmon harvest in the Cordova area of Prince William Sound, 1983-1994.

YEAR	Alaganik Slough	Clear Creek	Eyak Drainage[a]	Orca Inlet	Other Sites	Grand Total
1983	566	0	1,017	0	556	2,139
1984	673	0	1,284	50	499	2,506
1985	217	0	239	108	0	564
1986	46	0	2,767	474	153	3,440
1987	311	0	680	1,166	194	2,351
1988	2,183	0	1,201	1,691	236	5,311
1989	908	76	2,100	1,060	104	4,248
1990	316	70	1,462	1,883	169	3,900
1991	306	211	1,355	2,989	82	4,943
1992	729	16	2,996	1,377	32	5,150
1993	1,127	332	2,431	721	445	5,056
1994	433	568	3,083	1,592	257	5,933
1983-1993 MEAN	671	64	1,594	1,047	225	3,601
% CHANGE of 1994 FROM MEAN	-35%	786%	93%	52%	14%	65%

[a] Eyak Drainage includes Eyak River, Eyak Lake and Power Creek

From: Mills 1984-1994, Howe et al. 1995

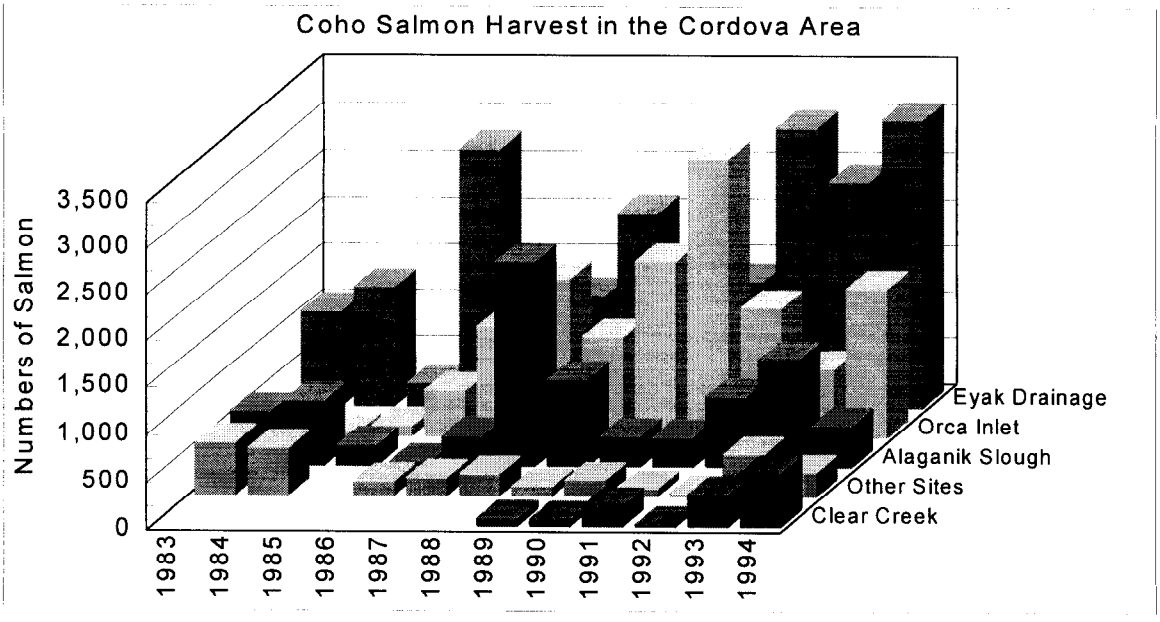


Figure 17.-Summary of coho salmon harvest in the Cordova area of Prince William Sound, 1983-1994.

Recent Fishery Performance

The sport harvest of coho salmon from PWS waters during 1994 was 30,573. This harvest accounted for just over 44% of the total coho salmon harvest from CGMA waters during 1994, a figure that is similar to the average contribution of this area since 1983. As was the case in the past, Valdez Arm supported the largest harvest of coho salmon in PWS, followed by fisheries in the Cordova road system (Table 10 and Figure 10).

Although harvest and catch figures are not yet available for 1995, I anticipate that the harvest will be above historic levels for this area.

Management Objective

The stocking of coho salmon in PWS is accomplished entirely by PNP hatcheries, therefore the following specific management goals are stated as ideals for these stocking programs. For hatchery-produced coho salmon stocked at Whittier and Cordova (Orca Inlet) the management objectives are to: (1) produce, through supplemental hatchery production, an annual return of 5,000 coho salmon at each location; (2) provide 10,000 angler-days of fishing opportunity annually at each location; and (3) promote diverse sport fishing opportunity by providing coho salmon to both boat and shore-based anglers. For hatchery-produced coho salmon stocked at Valdez, the management objectives are to: (1) produce, through supplemental hatchery production, an annual return of 25,000 coho salmon; (2) provide 50,000 angler-days of fishing opportunity annually; and (3) promote diverse sport fishing opportunity by providing coho salmon to both boat and shore-based anglers.

For the wild stocks of coho salmon on the Copper River Delta, the management objective is to meet the minimum escapement guidelines while providing for at least 4,000 angler-days of effort annually. The biological escapement goal for the Copper River delta is 53,800 coho salmon.

No specific fishery objectives for the remaining coho salmon fisheries in PWS have been established to date. An assumption of past and current fisheries management, however, has been to assure the sustained yield of the various wild coho salmon stocks that occur within PWS while assuring continued and, where possible, expanded opportunity to participate in area-wide coho salmon fisheries.

Recent Board of Fisheries Actions

The most recent BOF action for this fishery occurred in 1990 when the Board opened Solomon Gulch Creek, adjacent to the VFDA Hatchery, to sport fishing for salmon 300 feet downstream of the VFDA weir. Additionally, the Board established a "traditional fly-fishing-only-area" on Eyak River in response to concerns voiced by the Copper River/Prince William Sound Advisory Committee. The committee felt that anglers were snagging fish in Eyak River and gear restrictions were necessary to reduce this practice. No BOF actions relative to this fishery occurred at the 1994 meeting. No proposals were submitted for the 1997 (December 1996) meeting.

Current Issues

One issue that has been of concern in recent years is the developing sport fishery along the Copper River Delta. The streams along the Copper River Delta were reopened to sport fishing for salmon in 1988 after being closed for conservation concerns in the early 1970s. This issue is being resolved through community and departmental response, however, this issue should continue to be monitored. In 1992, a large number of locals and the Commissioner of Fish and

Game expressed concern at the large numbers of boats participating in the sport fishery near the mouth of Eyak River and bank anglers along the various streams along the Delta. The common concern was that these targeted sport fisheries were efficient enough that there would not be sufficient escapement to meet the minimum escapement guidelines. These concerns were further exacerbated by anglers participating in a coho derby sponsored by the Chamber of Commerce. The original intent of the derby was to target on the hatchery-produced coho salmon returning to Fleming Spit, but since the returns to Fleming Spit were poor, anglers directed their effort on the wild stocks along the Delta. In 1994 the derby rules were changed to eliminate fish size as a winning category. Fish were tagged and released only at Fleming Spit, thus, catch and release fishing targeting large fish in the Eyak River was eliminated. The Chamber was commended for initiating this change for conservation reasons. The returns to Fleming Spit have improved since 1992, and the escapement into the Eyak River in 1994 was excellent.

The department does not feel there are any major conservation concerns with the Copper River Delta coho stocks. Staff believe the necessary tools to manage these fisheries, including both sport and commercial, on a sustained yield basis exist. Biweekly escapement surveys and commercial fishery openings provide data necessary to manage these fisheries. If any of the streams are not meeting the minimum escapement guidelines, the department can respond with an emergency order as was issued in 1992.

This division measures the success of its programs in part by the level of participation in each fishery. In particular, the expanding sport fishery in Eyak River is not viewed as detrimental, provided escapement guidelines are met. Proposals to unduly restrict these fisheries will be viewed by the department as allocative in nature.

Another concern that appears to be developing is the increased pressure on the small coho stocks returning to the shorter coastal streams on Hawkins Island and along the shores of Orca Bay and Orca Inlet. An increase in "floating lodges" and charter activity has increased pressure on these streams.

Ongoing Research and Management Activities

Division of Commercial Fisheries Management and Development currently conducts escapement surveys of the clearwater streams adjacent to the Copper River Highway.

Recommended Research and Management Activities

Increased monitoring of the Orca Bay and Orca Inlet coho fisheries should be implemented. A system for monitoring and evaluating the increase in road system fisheries should continue.

Prince William Sound Chinook Salmon Fishery

There is very little wild production of chinook salmon in PWS and the sport fishery is supported almost entirely by hatchery-produced fish. There is a small but growing harvest of feeder chinook (winter kings) by residents in Cordova and Valdez and a few charters target them. Chinook salmon smolt have been stocked at Valdez, Cordova, and Whittier, and returns from these stocking efforts have established sport fisheries at Whittier and Cordova. Chinook salmon return to hatchery release sites from mid-May through June, and anglers can harvest feeder kings throughout the year, with the winter months being most productive.

Most waters of PWS are open to the taking of chinook salmon year-round, with a bag and possession limit of two fish per day and four fish in possession. Closed waters include Eccles

Creek, the Eyak Lake drainage, and Hartney Creek, all near Cordova, and all freshwater drainages of Valdez Arm except for Robe River and Solomon Gulch Creek.

From 1983-1993, the mean harvest of chinook salmon from marine waters of PWS has been 690 fish, accounting for 34% of the historical mean harvest of chinook salmon for the CGMA during this period (Table 12 and Figure 12). Just over 43% of this harvest has been from Valdez Arm. The next largest harvest occurs in the non-road-accessible areas near Whittier which account for 24% of the historical mean harvest. The fishery on the Robe River accounts for the majority of the chinook harvest in Valdez Arm. Since 1988 in Valdez, wild stock production has been supplemented by hatchery-produced smolt. The first release of chinook salmon at Anderson Bay, which is accessible only by boat, did not prove to be productive in providing additional fishing opportunities and was canceled after only one year. Since 1991, chinook salmon smolt were released at 6.5 Mile Creek, a tributary of Lowe River, to establish a marine fishery near Allison Point. This program has been discontinued due to problems with bacterial kidney disease in brood stock from Esther Hatchery.

The Whittier area sport fishery for chinook salmon is supported primarily by returning hatchery fish. The chinook salmon smolt release program has produced variable returns to the Whittier area and, correspondingly, the sport harvest has also fluctuated. The harvest has ranged from 0 to 367 chinook salmon from 1983-1994 (Table 12 and Figure 12). This fishery takes place in and around the Whittier boat harbor and near the mouths of Shakespeare and Cove creeks. Both shoreline and boat anglers participate in this fishery. A similar fishery has been established for chinook salmon at Fleming Spit near Cordova. Similar trends to those observed in the Whittier fishery have also occurred. These fisheries are being phased out (perhaps temporarily) by PWSAC in order to control problems with bacterial kidney disease in the brood stock.

Recent Fishery Performance

The sport harvest of chinook salmon from PWS waters during 1994 (1,724) is an increase from the historical mean harvest for the area since 1983 (Table 12 and Figure 12).

Management Objective

The stocking of chinook salmon in PWS is accomplished entirely by PNP hatcheries, therefore the following specific management goals are stated as ideals for these stocking programs. For hatchery-produced chinook salmon at Whittier, Valdez Arm, and Orca Inlet the management objectives for each location are to: (1) produce through supplemental hatchery production an annual return of 3,000 chinook salmon, (2) provide 6,000 angler-days of fishing opportunity annually, and (3) promote diverse sport fishing opportunity by providing early-run chinook salmon to both boat and shore-based anglers.

No other specific fishery objectives have been formally established for PWS chinook salmon fisheries to date. An assumption of past and current fisheries management, however, has been to assure the sustained yield of the various wild chinook salmon stocks that occur within the CGMA while assuring continued and, where possible, expanded opportunity to participate in hatchery-supported chinook salmon fisheries in the area.

Recent Board of Fisheries Actions

There has not been any recent regulatory action on this fishery.

Current Issues

The main issue, with regard to chinook salmon fisheries in PWS, is the phasing out of chinook stocking activities due to bacterial kidney disease in the brood stock. Residents in the major port communities, especially Whittier, have expressed concern over the loss of this resource and have requested assistance from the state hatchery system and from the PNP hatcheries to find a solution. Currently PWSAC is implementing steps to resolve the disease problem and has received support from the City of Whittier and from the department. It is anticipated that stocking will resume after the problem is resolved, but this may take several years. Currently the state chinook production is fully allocated and no stocking in PWS is possible at this time. However, as increased production capacity comes online with water supply renovations being made at Fort Richardson hatchery, chinook stocking in PWS may become a viable option.

Ongoing Research and Management Activities

There are no ongoing research or management activities for this fishery.

Recommended Research and Management Activities

The VFDA has requested assistance in developing a chinook salmon brood stock for release in Valdez Arm. PWSAC has also expressed an interest in changing the brood stock they currently use. During the summer of 1996 PWSAC will collect disease screening samples from chinook stocks in the Gulkana River near the outlet of Paxson Lake. Prior to the department approving the use of a new stock this issue will have to be deliberated by the regional planning team and the Salmon Harvest Task Force. In addition the department may recommend that these PNP hatcheries conduct a public review process to address issues concerning conservation of Copper River chinook and the impact of this action on this resource.

Prince William Sound Pink Salmon Fishery

There are over 200 streams in PWS that support wild returns of pink salmon. In addition, there are four PNP hatcheries that produce pink salmon. Pink salmon return to PWS from mid-June through late August, with the peak of the return occurring in late July.

The sport fishing season is open all year and the bag and possession limit for salmon other than chinook is six fish per day and 12 in possession except in the freshwater drainages crossing the Copper River Highway and the Robe River near Valdez, where the bag and possession limits are three and three, respectively. There are some waters that are not open to pink salmon fishing. These waters include Eccles Creek, Eyak Lake drainage, and Hartney Creek all near Cordova, and all freshwater drainages of Valdez Arm except for Robe River and Solomon Gulch Creek.

The pink salmon sport fishery harvest in PWS has been the largest in the state since 1985 (Howe et al. 1995). The average harvest of pink salmon in PWS has been 32,468 fish from 1983 through 1993, which accounted for an average of 85% of the total CGMA pink salmon harvest over this period (Table 14 and Figure 14). Eighty-seven percent of this harvest has been from Valdez Arm. The fishery in Valdez Arm targets early-run pink salmon returning to the VFDA Solomon Gulch Hatchery. The pink salmon return to Solomon Gulch Hatchery has ranged in numbers from less than a million to nearly 14 million in 1994. The returning pink salmon are intended primarily for the commercial fishery and cost recovery at the Solomon Gulch Hatchery. From 1983-1993, the average harvest of pink salmon from Valdez Arm has been 28,394 fish (Table 14). Shore-based anglers fishing at Allison Point have accounted for 54% of the average

harvest from 1983 through 1993 (Table 18 and Figure 18). Other significant fisheries for pink salmon in PWS occur in non-road-accessible areas and in Whittier.

Recent Fishery Performance

The sport harvest of pink salmon from PWS waters in 1994 (51,538) was an increase over recent years harvest for the area (Table 14). This harvest accounted for just over 90% of the total pink salmon harvest from CGMA waters during 1994. As was the case in the past, Valdez Arm supported the largest harvest of pink salmon, with 46,494 fish being harvested.

Management Objective

The stocking of pink salmon in PWS is accomplished entirely by PNP hatcheries, therefore the following specific management goals are stated as ideals for these stocking programs. For hatchery-produced pink salmon returning to Valdez Arm the management objectives are: (1) produce through supplemental hatchery production a sport harvest of 50,000 pink salmon; (2) provide 25,000 angler-days of pink salmon fishing opportunity annually; and (3) promote diverse sport fishing opportunity by providing pink salmon to both boat and shore-based anglers.

No other specific fishery objectives have been formally established for PWS pink salmon fisheries to date. An assumption of past and current fisheries management, however, has been to assure the sustained yield of the various wild pink salmon stocks that occur within the area while assuring continued and, where possible, expanded opportunity to participate in fisheries targeting hatchery stocks.

Recent Board of Fisheries Actions

The most recent BOF action for this fishery was in 1990 when the Board opened Solomon Gulch Creek, adjacent to the VFDA hatchery in Valdez, to salmon fishing 300 feet downstream of the VFDA weir. No actions relative to this fishery were made during the 1994 meeting and no proposals are slated for the 1997 (December 1996) meeting.

Current Issues

The large commercial harvest drives the management of the PWS pink salmon sport fishery. The magnitude of sport harvest will likely remain inconsequential towards achieving escapement goals or determining harvest strategies, however the sport fishery is of great economic importance to the community of Valdez. The Valdez Chamber of Commerce conducts a pink salmon derby and a significant public relations campaign designed to promote fishing-related tourism. Conflicts or perceived conflicts between the sport and commercial fisheries have occurred in the past and are of great concern to the community of Valdez. The area managers for these two divisions have worked together with hatchery managers to develop strategies to minimize further conflicts. These strategies include keeping the commercial fleet primarily in the western portion of Valdez Arm and maintaining an area closed to commercial fishing within 300 feet of the shore around Allison Point. These strategies have been effective since 1993 in maintaining an orderly fishery.

Table 18.-Summary of pink salmon harvest in the Valdez Arm area of Prince William Sound, 1983-1994.

YEAR	Boat	Shore	Stream	Total Valdez Area
1983	8,696	0	0	8,696
1984	9,676	12	137	9,825
1985	16,059	12,152	239	28,450
1986	12,858	9,312	0	22,170
1987	8,855	18,216	0	27,071
1988	10,659	16,117	0	26,776
1989	14,740	18,139	43	32,922
1990	18,077	28,653	0	46,730
1991	16,128	32,481	9	48,618
1992	14,518	14,069	9	28,596
1993	13,417	19,062	0	32,479
1994	15,822	30,604	68	46,494
1983-1993 MEAN	13,062	15,292	40	28,394
% CHANGE of 1994 FROM MEAN	21%	100%	71%	64%

From: Mills 1984-1994, Howe et al. 1995

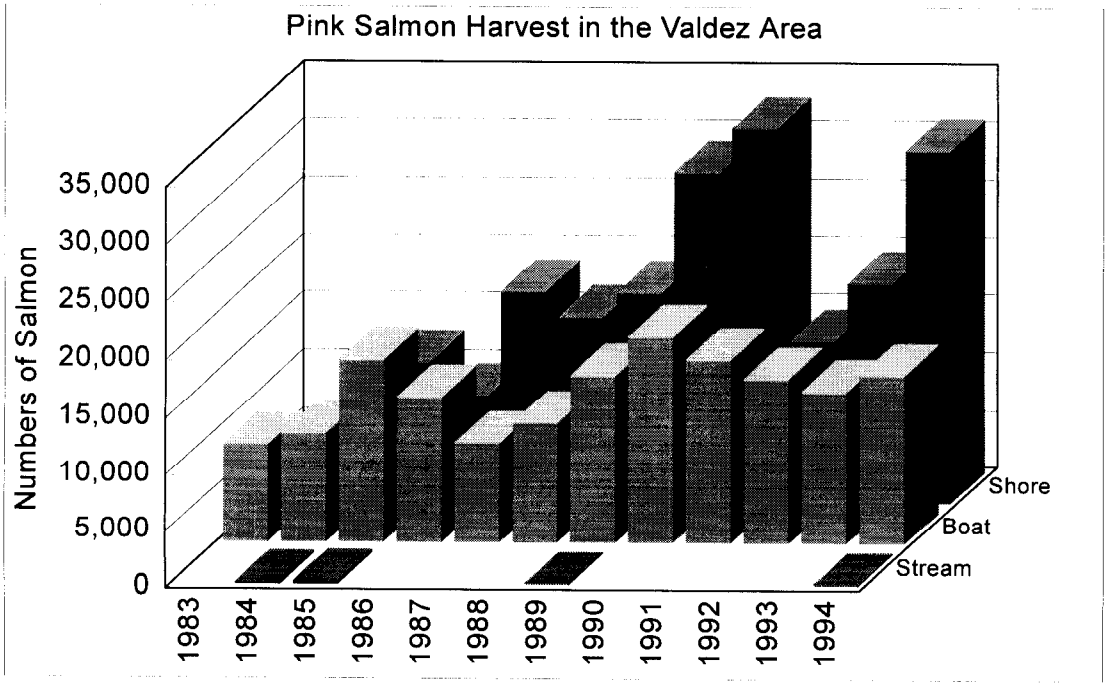


Figure 18.-Summary of pink salmon harvest in the Valdez Arm area of Prince William Sound, 1983-1994.

Ongoing Research and Management Activities
The Division of Sport Fish does not currently conduct any research on pink salmon stocks in PWS, however the Division of Commercial Fisheries conducts extensive research programs in PWS. Area managers for these two divisions should continue to work together to reduce potential conflicts between these commercial and sport fisheries.

Recommended Research and Management Activities
No additional research or management activities are recommended for this fishery at present. At this time, no changes in regulation are recommended with respect to this fishery.

Prince William Sound Sockeye Salmon Fishery

Sockeye salmon return to PWS streams from June through August, with peak immigration varying by stream. Spawning occurs from mid-July through September.

Current bag and possession limits governing the sport fishery for salmon other than chinook are six and 12 fish, respectively, except in all freshwater drainages crossed by the Copper River Highway, including Clear Creek, where the bag and possession limit is three fish; in Eshamy Creek drainage the limits are three fish per day and six in possession; and in Robe River, near Valdez, the bag and possession limit is one fish.

Historically the major fisheries for sockeye salmon in PWS have occurred at Eshamy, Cordova, Valdez and Coghill. From 1983 through 1993, the average harvest of sockeye salmon from PWS was 4,686 (Table 19 and Figure 19). Just over 59% of this harvest has been from non-road-accessible areas of PWS (Eshamy, Coghill and "other"). Since 1983, the average harvest of sockeye salmon from non-road-accessible areas has been 2,781 fish. The sockeye fisheries at Coghill and Eshamy have dropped significantly in recent years. Coghill was closed entirely in 1992, 1993 and 1994, and the seasons at Eshamy were reduced during those same years.

Recent Fishery Performance
The sport harvest of sockeye salmon from PWS during 1994 (6,948) was 48% above the historical harvest (Table 19 and Figure 19). The harvest of sockeye from non-road-accessible areas represented 22% of the total PWS harvest. Non-road-accessible harvests were down drastically from the usual harvest, however, the harvest in the road-accessible areas was up substantially.

The 1992 record harvest was the result of a large harvest at the remote area near Davis Lake. Sockeye smolt were released into Davis Lake in 1990 in an attempt to build a brood source for Coghill Lake egg takes and to possibly create another off-station release location for the commercial fishery. Because of concerns for wild stocks of sockeye returning to Coghill Lake in 1992, the commercial fishery was able to operate in the vicinity of Golden Lagoon and anglers were afforded an excellent opportunity to harvest hatchery-produced sockeye salmon. The fishery proved to be successful for sport fishing and was popular with not only private boat owners but also aircraft charter operators based in Anchorage. This program was discontinued, however, in 1993 due to continued concerns over Coghill stock interception.

The 1993 and 1994 returns of sockeye salmon to Coghill Lake were insufficient to meet escapement goals, consequently the sport and commercial fisheries were closed. Actions by the CFMD area managers and lake fertilization efforts have restored returns to Coghill and the 1995

Table 19.-Sport harvest of sockeye salmon in Prince William Sound, 1983-1994.

YEAR	Coghill	Eshamy	Valdez	Cordova	Other	Grand Total
1983	781	1,315	343	1,082	1,603	5,124
1984	249	1,048	811	112	1,857	4,077
1985	554	836	1,085	130	303	2,908
1986	657	688	413	321	2,799	4,878
1987	417	634	1,756	507	1,575	4,889
1988	146	637	1,582	600	1,818	4,783
1989	344	352	881	661	1,701	3,939
1990	49	175	1,630	466	1,242	3,562
1991	0	152	1,471	806	1,325	3,754
1992	0	649	2,153	1,578	3,978	8,358
1993	79	581	1,235	1,321	2,053	5,269
1994	19	148	2,368	3,066	1,347	6,948
1983-1993 MEAN	298	642	1,215	689	1,841	4,686
% CHANGE of 1994 FROM MEAN	-94%	-77%	95%	345%	-27%	48%

From: Mills 1984-1994, Howe et al. 1995

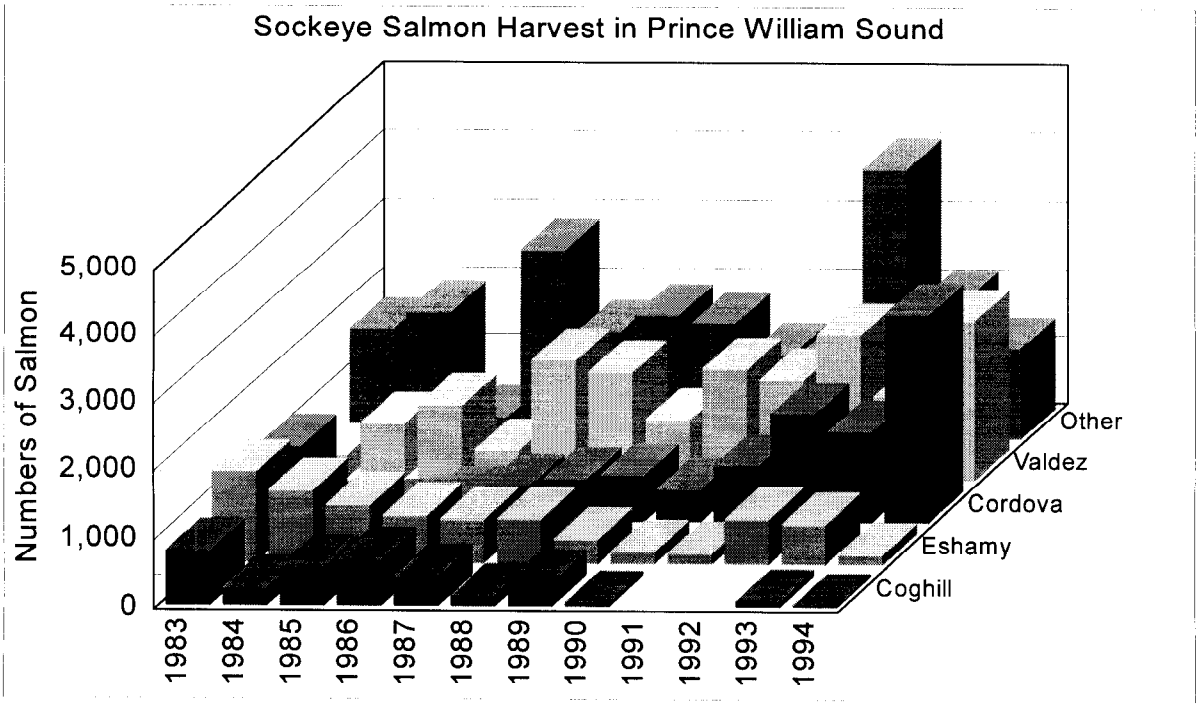


Figure 19.-Sport harvest of sockeye salmon in Prince William Sound, 1983-1994.

return was strong, providing a good escapement count and a productive sport fishery. During these same years the sockeye fishery at Eshamy was reduced due to low early returns. A result of these low returns was the emergency closure of Eshamy to sport fishing in 1993 and 1994. The timing of returns to Eshamy Lagoon appears to be getting later. Whereas escapement goals were met in 1993 and 1994, the timing of the peak returns has shifted from mid-August to late September.

Management Objective
For sockeye salmon returning to Eshamy and Coghill lakes, the management objective is to meet the minimum escapement goals (35,000 Eshamy and 25,000 Coghill), while providing at least 2,000 angler-days of effort annually at each location.

No other specific fishery objectives have been formally established for PWS sockeye salmon fisheries to date. An underlying assumption of past and current fisheries management, however, has been to assure the sustained yield of the various wild sockeye salmon stocks that occur within PWS while assuring continued and, where possible, expanded opportunity to participate in fisheries targeting these stocks.

Recent Board of Fisheries Actions
No specific actions were taken by the Board with respect to this fishery during their 1994 meeting.

Current Issues
Eshamy Lake stocks continue to be depressed. Coghill Lake appears to be recovering as a result of management action and lake fertilization efforts. Managers should continue to monitor escapement inseason and take appropriate management action to assure escapement is met.

Ongoing Research and Management Activities
No specific research or management activities are directed at this fishery by Division of Sport Fish although the Division of Commercial Fisheries conducts an extensive research and management program.

Recommended Research and Management Activities
No additional research or management activities are recommended for this fishery at present.

Prince William Sound Cutthroat Trout Fisheries

Cutthroat trout are available to anglers throughout the year in the CGMA, however, peak fishing opportunities typically occur as the fish migrate to and from overwintering and spawning areas. Peak harvest typically occurs in May and from mid-July through September. Spawning begins in April and lasts into June.

The daily bag and possession limit for PWS is two cutthroat trout with no size limit except for the freshwater drainages crossed by the Copper River Highway. In these road-accessible areas, the bag and possession limit is five of which no more than one can be over 10 inches in length. Historically all streams in the CGMA were open yearlong to fishing for cutthroat trout. A Board of Fisheries action in 1994 established a spawning season closure from April 15 through June 14.

The average harvest of cutthroat trout in PWS has been 1,208 fish for 1983 through 1993 (Table 20 and Figure 20). There are three major historical harvest areas for cutthroat trout in PWS,

Table 20.-Sport harvest of cutthroat trout in Prince William Sound, 1983-1994.

YEAR	Eyak Drainage	Other Cordova Area	Eshamy Area	Other PWS Areas	Grand Total
1983	356	1,080	147	241	1,824
1984	137	736	274	1,395	2,542
1985	119	69	554	173	915
1986	214	687	153	566	1,620
1987	833	217	272	36	1,358
1988	109	109	219	182	619
1989	300	553	39	619	1,511
1990	164	147	33	179	523
1991	68	48	213	87	416
1992	73	559	0	383	1,015
1993	75	335	11	519	940
1994	154	289	0	169	612
1983-1993 MEAN	223	413	174	398	1,208
% CHANGE of 1994 FROM MEAN	-31%	-30%	-100%	-58%	-49%

From: Mills 1984-1994, Howe et al. 1995

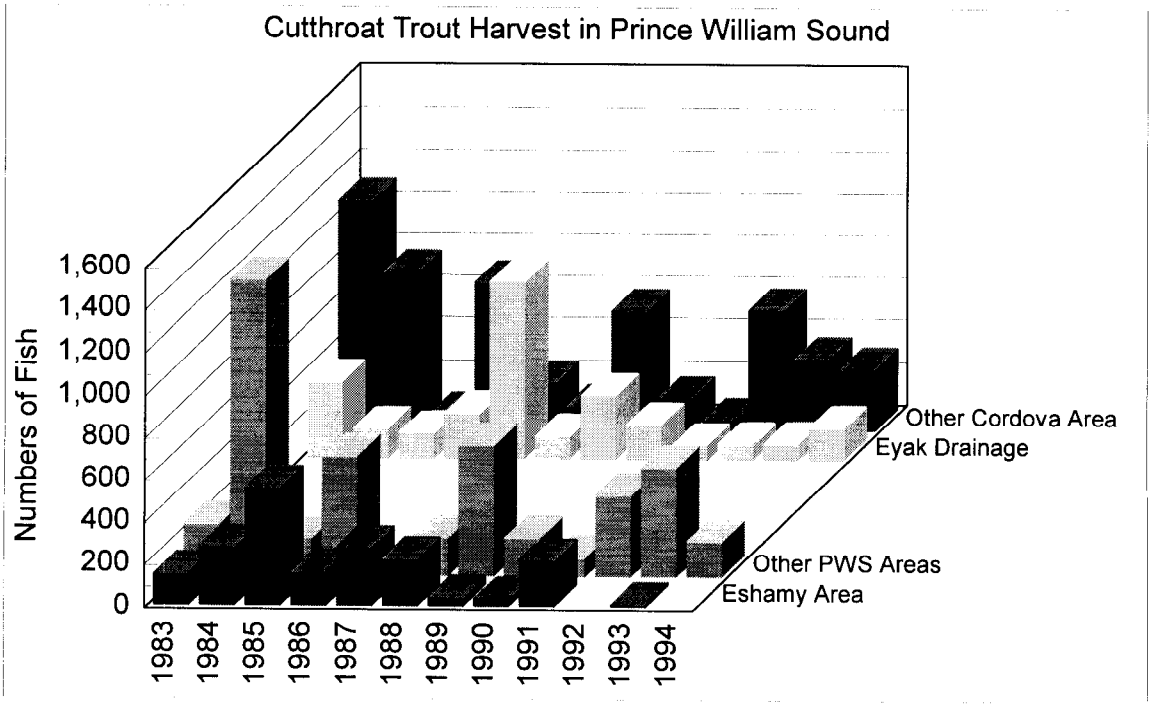


Figure 20.-Sport harvest of cutthroat trout in Prince William Sound, 1983-1994.

Eshamy drainage, Eyak drainage, and other Cordova road-accessible streams, which account for 14%, 18% and 34%, respectively, of the PWS harvest. Other sites dispersed throughout the northern and eastern portions of the sound account for the remaining 33% of the harvest.

Recent Fishery Performance

The sport harvest of cutthroat trout from PWS during 1994 (612) was 49% below the historical mean harvest for the area (Table 20). The harvests in the three major historical harvest areas for cutthroat trout in PWS, Eshamy drainage, Eyak drainage, and other Cordova road-accessible streams were all well below the historical average by 100%, 31% and 30%, respectively. The harvest of cutthroat trout in areas outside these locations decreased to 169, a decrease of 58%.

Eshamy Creek drainage and Green Island Creek were closed by emergency order (2-CT-6-02-92) in 1992 during the spawning season. Information collected by the Natural Resource Damage Assessment program following the *Exxon Valdez* oil spill indicated that cutthroat in the oil-impacted area had reduced survival and growth. There was concern that the stocks may be unable to sustain historical levels of harvest, especially during spawning season. This emergency order reduced the harvest to zero in these areas. A similar emergency order was also written in 1993. Board of Fisheries actions in 1994 established a spawning closure from April 15 through June 14.

Management Objective

The management objective for cutthroat trout is to stabilize the harvest of cutthroat trout to 500 fish while still providing 2,000 angler-days of fishing effort. This harvest level represents approximately an overall 10% fishing mortality on PWS cutthroat trout and should aid in the recovery of stocks impacted by the *Exxon Valdez* oil spill.

Recent Board of Fisheries Actions

During the 1991 Board meeting, the PWS bag and possession limit for cutthroat trout was reduced from a daily bag and possession limit of five fish per day and 10 in possession of which only one per day and two in possession can be over 20 inches in length to a two fish daily bag and possession limit with no size limit except for the freshwater drainages crossed by the Copper River Highway. In these road-accessible areas, the bag and possession limit is five, of which no more than one can be over 10 inches in length. As mentioned earlier, Board of Fisheries actions in 1994 established a spawning closure from April 15 through June 14.

Current Issues

Prince William Sound is the most northern and western extreme of the natural range for cutthroat trout, and the populations are small in size and distribution. Populations of fish on the outer extremes of their distribution tend to be more susceptible to environmental changes and exhibit highly variable survival rates. Cutthroat trout are also subject to incidental catch in the commercial fisheries, increasing the risk to these small stocks. There are concerns regarding the sustainability of even the present small harvest. Some specific cutthroat trout stocks in the Pacific northwest have been selected as candidates for being listed as threatened species under the Endangered Species Act. Careful management is necessary to avoid this possibility for the PWS stocks.

Information collected by the Natural Resource Damage Assessment program following the *Exxon Valdez* oil spill documented injury to cutthroat trout in western PWS (Hepler et al. *In prep*). Mortality rates of sea-run cutthroat trout from oiled areas (Green Island and Eshamy creeks) were

significantly higher than from sites in the nonoiled areas of eastern PWS. There was also a significant reduction in growth of fish from oiled sites. Both Green Island and Eshamy creeks are popular sport fishing sites supporting small populations of sea-run cutthroat trout numbering less than 200 fish. Given the additional mortality due to oil effects, available information suggests that oil impacted stocks may be unable to sustain historical levels of harvest. Reduction in growth due to oil perturbation may result in lowered reproductive potential. Each of these possible repercussions causes immediate concerns for the cutthroat stocks of Green Island and Eshamy creeks.

Ongoing Research and Management Activities

There are no ongoing research projects for this fishery by the department, however, the department has provided support for an oil spill funded research project being conducted by the Cordova Ranger District of the U.S. Forest Service at Mile 18 on the Copper River Highway. This project is monitoring the escapement of cutthroat into this system and is radio-tracking fish to determine spawning locations for characterization of spawning habitat requirements. Data collected will be used to identify locations for restoration of cutthroat habitat loss due to road construction and logging along the Cordova Road System.

Two other oil-spill funded restoration/enhancement projects are being conducted in western PWS by the Glacier Ranger District of the U.S. Forest Service. One consists of the enhancement of spawning and rearing habitat for cutthroat trout in Otter Creek on the north end of Otter Lake. The other is directed toward the enhancement of rearing habitat at three locations: Gunboat Creek in Eshamy Bay, Billy's Hole in Long Bay, and Red Creek which drains into Esther Passage.

An additional EVOS restoration project directed at cutthroat trout is being conducted by the Forest Service's Pacific Northwest Research Station, Forestry Sciences Laboratory in Corvalis Oregon. This is a genetics project focused on determining if the various anadromous runs in the sound are composed of unique stocks or of one genetic type. This project is also looking at the genetic differences between the landlocked and anadromous stocks within a stream system. Otoliths will also be examined to determine the life-history characteristics of these runs. The information gathered from this project could prove valuable for management of cutthroat trout within the sound. The department, however, is concerned about the lethal sampling required by this project and has worked closely with the project leaders to select the sample site and set sample sizes.

Recommended Research and Management Activities

Cutthroat trout typically spawn from April through June. Fishing for cutthroat during critical spawning periods, even if released, places additional stress on the fish. This stress increases fishing related mortality and further impacts the reproductive potential of this resource. Even though the department has information on the impact of oil from only two sites, data suggest that these sites are locations of overwintering populations comprised of a number of different spawning stocks. Consequently, the only way to effectively reduce fishing mortality on these stocks is to enact areawide restrictions. Based on this information, the department issued emergency orders restricting the harvest of cutthroat trout in PWS in 1992 and 1993. The department also submitted a proposal to prohibit fishing for cutthroat trout during the spawning season from April 16 through June 15. The proposal was considered by the BOF during the February 1994 meeting and was enacted.

In the fall of 1995 the department submitted two proposals for FY97 funding through the EVOS restoration program. One project was to evaluate the recovery of cutthroat and Dolly Varden from the effects of the oil spill. This study consisted of a project similar to that conducted in 1989-1992 which documented the injury by the oil spill. The second project was designed to collect the information required to support the information requests made by the other EVOS restoration projects and to coordinate the EVOS cutthroat projects toward the development of a PWS cutthroat trout restoration management plan. The merit of these projects were recognized, however neither project was funded The department also proposed a cutthroat trout stock evaluation project for PWS through the department's FY97 budget process, however reductions in funding prohibited the projects.

CENTRAL GULF AREAWIDE FISHERIES

Central Gulf Management Area Halibut Fishery

Halibut are one of the most popular targets of recreational anglers fishing the marine waters of the CGMA. The majority of halibut are harvested from May through early September. The limits for halibut are two fish per day and four fish in possession. The fishery is open year-round with the exception of January when the fishery is closed to protect spawning halibut. Management issues and stock status are discussed by Vincent-Lang (1995) in the Area Management Report for the North Gulf of Alaska Recreational Groundfish Fisheries. Halibut and their fisheries are managed under an international treaty, the Halibut Convention of 1953 and its 1979 Protocol, therefore the Alaska Board of Fisheries has no management authority over halibut in Alaska.

The average sport harvest of halibut from CGMA area waters from 1983 through 1993 was about 20,000 (Table 21). During this period, harvests have risen annually, from approximately 5,700 halibut in 1983 to over 45,000 halibut in 1993 (Figure 21).

Seward area fisheries (Resurrection Bay) have consistently supported about half of the total harvest of halibut from CGMA waters (Table 21). Waters accessed from Seward extend from the entrances of Prince William Sound west to Gore Point, with most of the effort occurring between Cloudy Cape and Cape Junken. Prince William Sound has supported an average sport harvest of about 9,500 halibut (Table 21) from 1983 through 1993. Waters fished in PWS include all inside waters as well as the entrances to PWS, with most of the effort occurring at the entrances. As has been the case for overall CGMA harvests, PWS halibut harvests have also increased near annually, from about 3,500 halibut in 1983 to about 20,000 halibut in 1993. The majority of the PWS halibut harvest has been by anglers fishing out of Valdez (Table 21). From 1983 through 1993, anglers returning to Valdez have harvested an average of 4,560 halibut.

The sport harvest of halibut from the CGMA during 1994 (48,555) was the highest on record and over twice the historical mean harvest from 1983 through 1993 (Table 21). As has been the case in the past, nearly half the halibut harvest came from Seward area waters, with the remaining harvest coming from PWS waters (Table 21). Harvests in both PWS and the Seward area were at

Table 21.-Sport harvest of halibut in the Central Gulf Area, 1983-1994.

YEAR	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	0	0	0	0	0	284	0	1,846	1,363	3,493	2,225	5,718
1984	0	237	200	0	0	387	0	1,322	2,282	4,428	3,242	7,670
1985	0	33	0	54	33	826	76	3,310	195	4,527	5,934	10,461
1986	91	596	0	305	474	1,086	92	3,669	2,018	8,331	10,398	18,729
1987	156	253	0	77	495	650	232	2,185	331	4,379	7,171	11,550
1988	649	963	48	193	312	1,143	818	4,599	1,120	9,845	11,696	21,541
1989	540	809	41	612	268	912	943	4,231	341	8,697	7,290	15,987
1990	1,075	486	22	329	860	1,038	578	6,045	418	10,851	9,500	20,351
1991	1,227	1,463	79	149	881	1,484	526	6,122	802	12,733	13,818	26,551
1992	1,578	2,305	125	358	945	1,151	767	8,379	2,247	17,855	18,595	36,450
1993	2,737	2,165	93	446	521	1,705	895	8,457	2,697	19,716	25,551	45,267
1994	3,239	2,488	0	764	1,746	2,438	1,496	7,457	3,859	23,487	25,068	48,555
1983-1993 MEAN	732	846	55	229	435	970	448	4,560	1,256	9,532	10,493	20,025
% CHANGE of 1994 FROM MEAN	342%	194%	-100%	233%	301%	151%	234%	64%	207%	146%	139%	142%

From: Mills 1984-1994, Howe et al. 1995

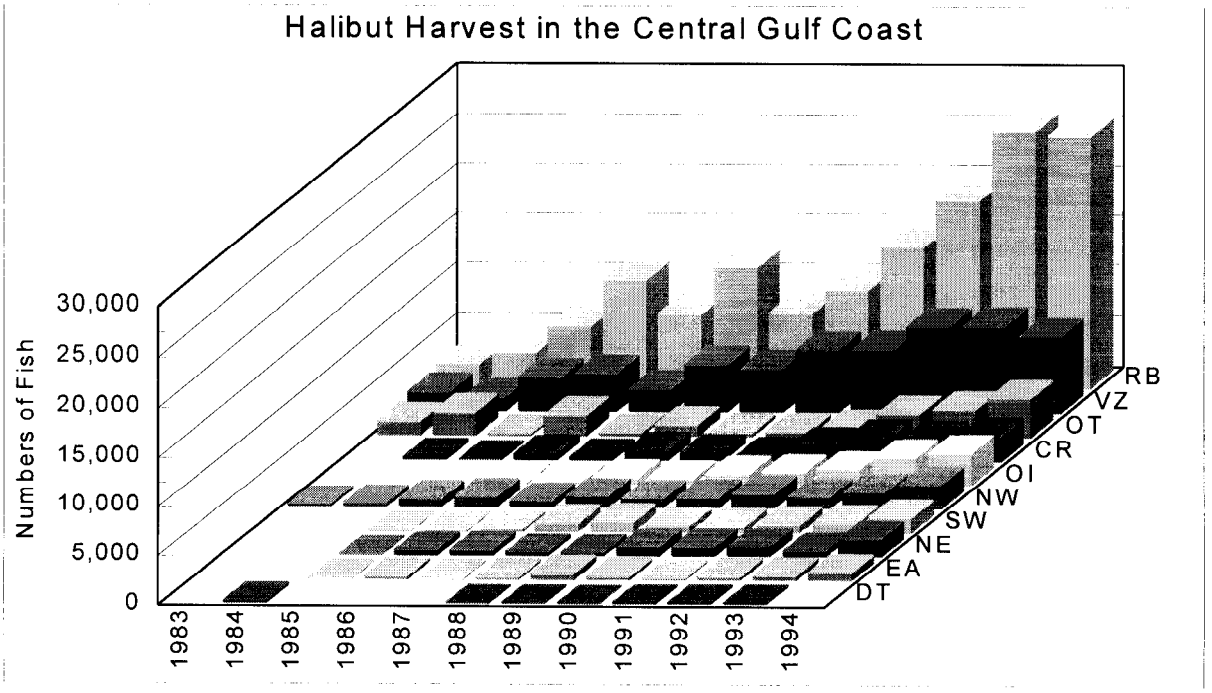


Figure 21.-Sport harvest of halibut in the Central Gulf Area, 1983-1994.

or near record levels. As in the past, Valdez harvest accounted for the majority of the total PWS halibut harvest (Figure 21). Considerable expansion in both the charter and private fleets has occurred in recent years in both PWS and the Seward areas.

Management Authority

Halibut and their fisheries are managed under an international treaty, the Halibut Convention of 1953 and its 1979 Protocol. Under this treaty, the International Pacific Halibut Commission (IPHC) was formed to assure for the optimal sustained yield of the North Pacific halibut resource. For purposes of management, the IPHC has divided the North Pacific halibut fishery into 10 regulatory areas, stretching from northern California to Alaska. The CGMA falls in regulatory area 3A. Each year, the IPHC establishes separate catch quotas for each of these regulatory areas that assure the halibut stock's optimal sustained yield. These catch quotas represent the maximum number of halibut that can be harvested from each area annually and, under the treaty, total harvest by all users groups cannot exceed these quotas. The IPHC does not, however, have the authority to allocate the catch quota amongst the various fisheries exploiting the halibut stock in United States waters. In U.S. waters, the responsibility for allocation of the catch quota amongst fisheries falls to the North Pacific Fishery Management Council (NPFMC) via the Magnuson Fisheries Conservation and Management Act of 1976. The Alaska Department of Fish and Game, Division of Sport Fish, provides technical data and other information to both the IPHC and the NPFMC to aid in making management and allocation decisions. The State of Alaska does not have direct management authority over halibut and halibut fisheries off Alaska.

Management Objective

Under treaty, North Pacific halibut stocks are to be managed for optimum sustained yield. Currently, the North Pacific halibut stock is fully utilized.

Management Approach

A constant exploitation strategy is used to manage North Pacific halibut stocks. The IPHC meets annually in January to calculate the exploitable biomass (yield) available for harvest in each of the 10 regulatory areas. Constant exploitation yield (CEY) is calculated for each regulatory area as the estimated exploitable biomass available times a 0.30 exploitation rate. Each CEY thus represents the total allowable harvest (in pounds) for each regulatory area. Under treaty, total harvest by all user groups cannot exceed this figure. The IPHC then estimates the sport (based on a two fish daily bag limit and four fish possession limit and February 1 through December 31 open season) and personal use/subsistence harvests and wastage and bycatch mortalities for each regulatory area. These are subtracted from the CEY on a regulatory area basis. The remainder is then "allocated" to the directed commercial halibut fishery. This factoring of the catch has, to the present, been done by the IPHC and the final numbers "approved" by the NPFMC on an annual basis. Under this management approach CEY changes annually, reflective of the estimated biomass of exploitable halibut present (i.e., quotas are lower during years of low exploitable biomass and higher during years of high exploitable biomass).

Ongoing Research and Management Activities

Sport Fish Division’s research program to evaluate the age and size compositions of the recreational halibut harvests from Area 3A waters will continue during 1995. Area 3A ports currently being sampled include Valdez and Seward in the CGMA and Kodiak and Homer. Findings from this research program are provided to the IPHC annually in a report summarizing

the characteristics of the sport harvest from Area 3A waters (Meyer 1996). This information is used by the IPHC scientific staff in a constant exploitation yield model which is used annually to compute the exploitable halibut biomass by area. Secondary objectives of the study are to provide fishery managers with information regarding characteristics of the fishing fleet operating out of study ports. These data are needed to evaluate proposed regulatory options for the sport charter industry in Alaska. Staff recommend continuation of the above described research for the immediate future.

Central Gulf Management Area Rockfish Fisheries

Rockfish are a popular target of recreational anglers fishing CGMA marine waters, and a variety of rockfishes, species of the genera *Sebastes* and *Sebastolobus,* inhabit the marine waters of the CGMA. For management purposes, these rockfishes are usually categorized into the following groups: slope rockfish, demersal shelf rockfish, and pelagic shelf rockfish. The recreational fishery primarily targets the demersal shelf and pelagic shelf rockfish groups, with slope rockfish only occasionally being harvested. Although many species of rockfish have been identified in the CGMA, the most commonly harvested rockfish in the CGMA are the demersal shelf yelloweye rockfish *Sebastes ruberrimus*, and pelagic shelf black *S. melanops* and dusky *S. ciliatus* rockfishes. Management, current issues and stock status are discussed by Vincent-Lang (1995) in the Area Management Report for the North Gulf of Alaska Recreational Groundfish Fisheries.

Although available year-round, most recreational rockfish are harvested from May through early September. The limits for rockfish in PWS are five per day and 10 in possession from May through September and 10 and 15 per day and in possession from September 16 through April 30. Also, all rockfish which are removed from the water must be retained as part of the bag limit of the person originally hooking it. The rockfish limits for the Outer Gulf Coast (Seward area) are five per day and 10 in possession year-round.

The average sport harvest of rockfish from CGMA waters from 1983 through 1993 was about 33,800 (Table 22, Figure 22). Outer Gulf Coast waters accessible from Seward have accounted for 70% of the total rockfish harvest from CGMA waters. The Resurrection Bay area rockfish fishery is one of the largest recreational rockfish fisheries in Alaska (Howe et al. 1995). Areas fished near Resurrection Bay include waters from the entrances to Prince William Sound to Gore Point; however, most of the fishery occurs in the vicinity of the capes and islands near the entrance to Resurrection Bay. Since 1983, PWS has supported an average sport harvest of about 10,000 rockfish (Table 22). This harvest has represented about 29% of the total harvest of rockfish from CGMA waters. Waters fished in PWS include all inside waters as well as the entrances to PWS, with most of the effort occurring at the entrances.

Commercial fishermen also harvest CGMA rockfish. Commercial harvests in PWS generally exceed those of recreational harvests. In contrast, recreational and commercial harvests in Resurrection Bay waters are more equal. During some years, recreational harvests from the marine waters near Seward have exceeded reported commercial harvests.

Table 22.-Sport harvest of rockfish in the Central Gulf Area, 1983-1994.

YEAR	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	0	0	0	0	0	1,112	0	3,703	1,699	6,514	17,990	24,504
1984	0	37	0	0	0	836	12	4,402	2,706	7,993	22,882	30,875
1985	0	380	0	0	0	1,974	98	6,304	97	8,853	17,105	25,958
1986	34	145	0	346	0	1,810	56	6,366	1,005	9,762	38,660	48,422
1987	0	0	0	388	456	1,971	495	3,175	78	6,563	12,768	19,331
1988	192	169	0	469	578	2,371	938	6,983	1,011	12,711	35,688	48,399
1989	125	270	0	290	343	2,374	1,377	7,072	1,068	12,919	24,946	37,865
1990	378	136	10	156	642	1,398	621	4,350	466	8,157	18,729	26,886
1991	256	477	0	0	383	2,497	775	3,979	366	8,733	19,803	28,536
1992	430	879	0	370	1,621	1,483	1,967	7,625	1,103	15,478	28,729	44,207
1993	1,563	335	18	233	395	2,158	1,159	4,894	1,519	12,274	24,978	37,252
1994	1,137	1,215	0	429	1,251	3,158	826	5,725	1,641	15,382	28,256	43,638
1983-1993 MEAN	271	257	3	205	402	1,817	682	5,350	1,011	9,996	23,843	33,840
% CHANGE of 1994 FROM MEAN	320%	373%	-100%	110%	211%	74%	21%	7%	62%	54%	19%	29%

From: Mills 1984-1994, Howe et al. 1995

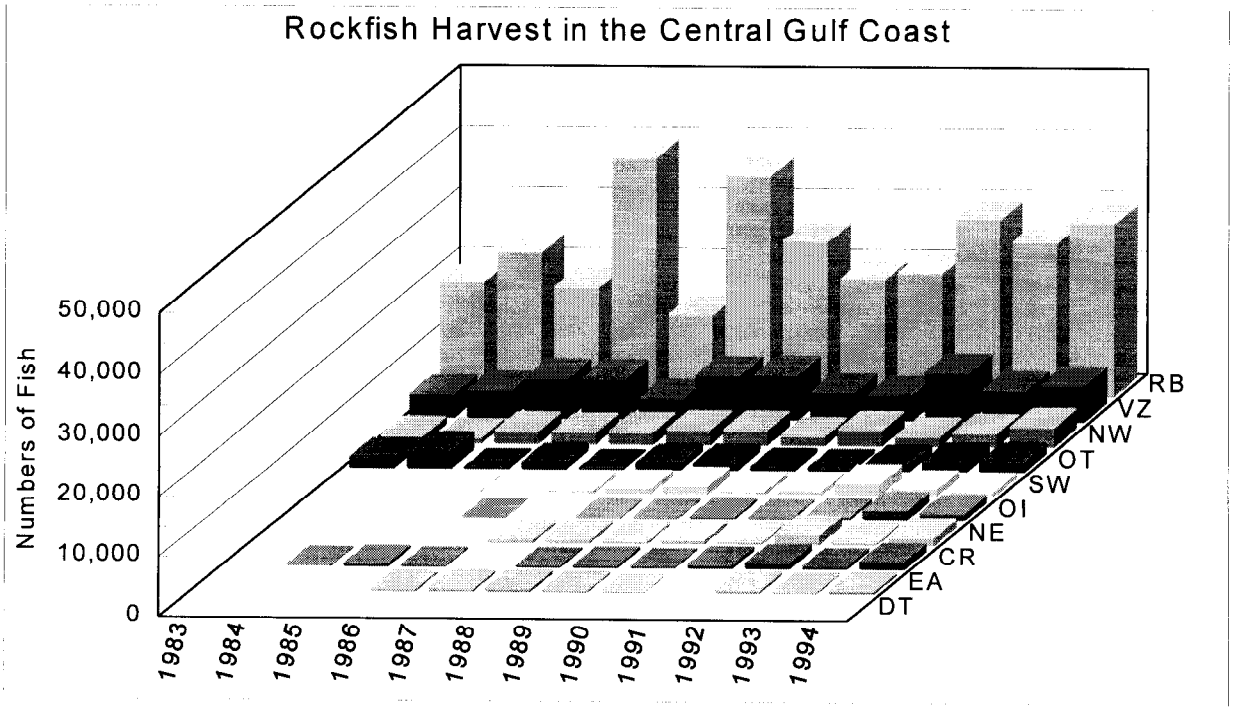


Figure 22.-Sport harvest of rockfish in the Central Gulf Area, 1983-1994.

The sport harvest of rockfish from CGMA waters during 1994 (43,638) was 29% above the historical mean harvest from 1983 through 1993 (Table 22). As in the past, Resurrection Bay area waters accounted for the majority (64%) of total rockfish harvest from CGMA. The increase in harvest from Resurrection Bay area waters is believed due to a shift in effort from depressed lingcod stocks towards rockfish stocks. The harvest of rockfish from Prince William Sound in 1994 was slightly above (7%) the average harvest since 1983. Most of the harvest was landed at Valdez and appeared to be due to a popular charter effort at this port.

Management Objective

Due to a lack of stock assessment data, no specific fishery objectives have been formally established for recreational rockfish fisheries of the CGMA. An assumption of past and current fisheries management, however, has been to assure the sustained yield of the various rockfish stocks that occur within the area while assuring continued and, where possible, expanded opportunity to participate in fisheries targeting these stocks.

Recent Board of Fisheries Actions

In 1991, the Board reduced the limits for rockfish in PWS from 20 per day and in possession to five per day and 10 in possession from May through September 15, and 10 per day and in possession from September 16 through April 30. Additionally, the Board mandated that all rockfish which are removed from the water must be retained as part of the bag limit of the person originally hooking them. These actions were taken to assure harvests would remain sustainable. In 1995, the Board changed the bag limits for rockfish so that only one per day and two in possession could be demersal rockfish.

Ongoing Research and Management Activities

A research program to evaluate rockfish stocks in the North Gulf of Alaska is currently underway. The objectives of this program are to collect age, sex, and length composition data and to obtain species composition statistics for the sport harvest of rockfish in this area. These data will be used to determine selected life history characteristics of the commonly harvested rockfish species and to evaluate stock status and validity of current management strategies. Staff recommend continuation of the current research program.

Central Gulf Management Area Lingcod Fisheries

A complete history of the recreational and commercial fisheries for lingcod in the north Gulf of Alaska through 1992 is provided in Vincent-Lang and Bechtol (1992), Meyer (1993), and Hepler et al. (1993). Management, current issues and stock status are discussed by Vincent-Lang (1995) in the Area Management Report for the North Gulf of Alaska Recreational Groundfish Fisheries. These reports also summarize the actions taken by the Board of Fisheries to manage these stocks for sustained yield and the rationale the Board used towards taking these actions.

Current regulations governing recreational lingcod fisheries in the CGMA are:

- Resurrection Bay, enclosed from a line extending from Cape Aialik to Cape Resurrection, is closed to the commercial and recreational harvest of lingcod. All lingcod caught in these waters must be released immediately. (This regulation was put in place in 1993 to protect and help rebuild severely depressed lingcod stocks in these waters.)
- The bag and possession limit for sport caught lingcod in the area between Cape Puget and Gore Point is one. (This regulation was put in place in 1993 to protect and help rebuild

depressed lingcod stocks in these waters.) The bag and possession limits for all other waters of the CGMA are two and four, respectively.

- Lingcod may only be retained from July 1 through December 31. (The closed period was put in effect in 1993 to protect spawning and nest guarding lingcod.)
- Only lingcod 35 inches or more in total length or 28 inches or more with their head off may be retained. (This regulation was established in 1993 to assure lingcod could spawn at least once prior to being subject to harvest.)
- All sport-caught lingcod may be landed only by hand or net. (This regulation was put in place in 1993 to increase the survival of released lingcod.)

Harvest estimates from the Statewide Harvest Survey for lingcod were not made until 1991. The 4-year average for the CGMA recreational lingcod fishery is 7,949 fish. The 1994 harvest for lingcod (5,370) was essentially the same as the previous year's harvest but less than half of the 1992 harvest (Table 23 and Figure 23). This decrease in harvest during 1993 and 1994 is believed to be the result of restrictions placed on Central Gulf of Alaska lingcod fisheries to protect depressed stocks in and near Resurrection Bay and to assure the sustained yield of currently healthy stocks in other CGMA waters. As has been the case in the past, most of the harvest occurred in the waters outside, but near to, Resurrection Bay (notably the Chiswell Islands).

Management Objective

Management of Central Gulf of Alaska lingcod stocks is directed towards assuring the sustained yield of the various lingcod stocks that occur within the area while assuring continued and, where possible, expanded opportunity to participate in fisheries targeting these stocks.

Management Approach

In the marine waters of the CGMA, insufficient data are currently available to estimate exploitable biomass. No research is currently being conducted, or planned, to collect these data in the near future. Thus, recreational lingcod fisheries in the CGMA are managed using a conservative approach aimed at assuring optimal sustained yield. Given that lingcod recruitment has been shown to be highly variable, the current management approach is to assure that sufficient fish are present in the spawning population to assure future recruitment. This is done in three ways: (1) protect spawning and nest guarding fish—the sport and commercial season is closed from January 1 through June 30, (2) allow fish to spawn at least once before being subject to harvest—a 35 inch minimum size limit for both sport and commercial fisheries, and (3) restrictive catch limits—the sport fishery is currently restricted to a two fish daily, four fish in possession limit in areas of healthy stock status; in areas of less healthy stock status, the daily bag and possession limit is reduced. The commercial fishery is restricted by catch limits and bycatch quotas.

Ongoing Research and Management Activities

A research program aimed at estimating the age, sex, and length compositions of the recreational lingcod harvests from Central Gulf of Alaska waters has been annually conducted since 1987.

Table 23.-Sport harvest of lingcod in the Central Gulf Area, 1983-1994.

YEAR[a]	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-	-	-	-	-	-
1985	-	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-	-	-
1991	142	157	0	0	71	274	95	1,122	118	1979	6,126	8,105
1992	337	177	9	37	74	252	92	1,476	121	2575	8,081	10,656
1993	343	74	20	27	80	150	148	1,117	49	2008	3,079	5,087
1994	383	58	0	51	147	303	234	287	195	1658	3,712	5,370
1983-1993 MEAN	274	136	10	21	75	225	112	1,238	96	2,187	5,762	7,949
% CHANGE of 1994 FROM MEAN	40%	-57%	-100%	139%	96%	34%	110%	-77%	103%	-24%	-36%	-32%

From: Mills 1984-1994, Howe et al. 1995

[a] Lingcod harvest not reported in SWHS until 1991.

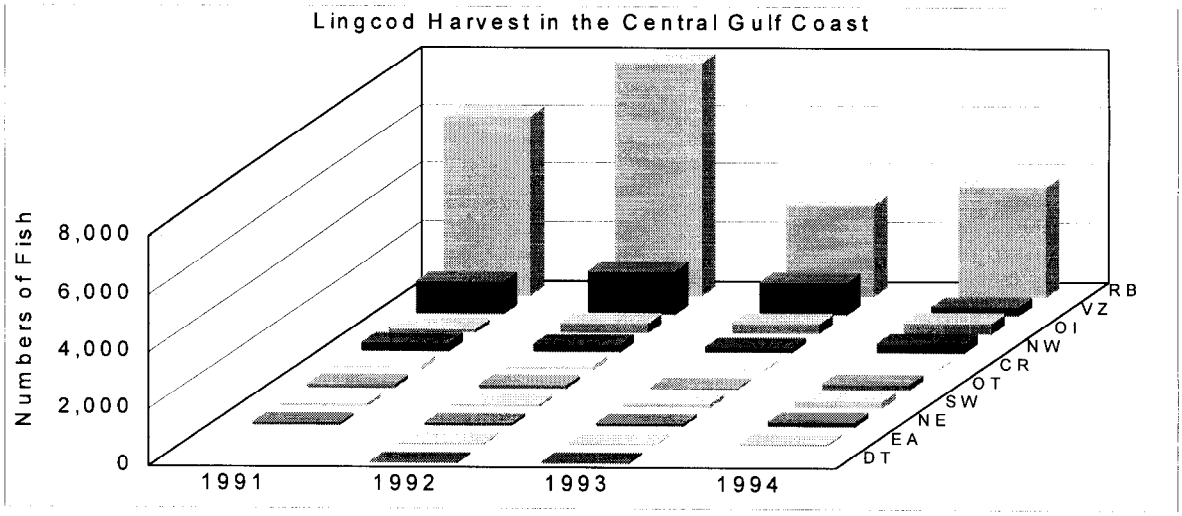


Figure 23.-Sport harvest of lingcod in the Central Gulf Area, 1983-1994.

Managers recommend continuation of this sampling program. In addition, a fishery-independent sampling program was implemented during 1993 to monitor the recruitment of depressed lingcod stocks in the Resurrection Bay area. With the implementation of minimum size limits, the ability to assess recruitment to these stocks was lost. Staff recommend that fishery-independent estimates of the age, sex, and size compositions of the lingcod stocks in Resurrection Bay be collected for the next 2-4 years.

Central Gulf Management Area Dolly Varden Fisheries

Dolly Varden are available to anglers throughout the year in the CGMA, however, peak fishing opportunities typically occur as the fish migrate to and from overwintering and spawning areas. Peak harvest typically occurs in May and from mid-July through September. Spawning begins in September and lasts into November.

All streams in the CGMA are open yearlong to fishing for Dolly Varden. The daily bag and possession limit for PWS is 10 Dolly Varden with no size limit and for Resurrection Bay the bag and possession limit is five fish.

Resurrection Bay supports a limited sport fishery for Dolly Varden. The average harvest has been 1,573 fish for 1983 through 1993. The majority of the harvest has occurred in the marine waters by anglers using private boats (Table 24 and Figure 24).

Sport fisheries for Dolly Varden in PWS account for an average of about three-quarters of the CGMA total Dolly Varden harvest or about 5,000 fish. Within PWS, significant fisheries for Dolly Varden include Valdez Arm area and the Cordova roadside streams (Table 25, Figure 25). The major producer in the Valdez Arm area was historically Robe River and Lake, however changes in the overwintering habitat in Robe Lake have reduced this harvest from as much as 5,500 fish in the early 1980s to 100-600 during the last 5 years. The saltwater harvest in Valdez Arm was the dominant producer in recent years (Table 26, Figure 26). Along the Cordova road system the Eyak River drainage is the major producer, with a very popular local fishery at Power Creek (Table 27, Figure 27).

Recent Fishery Performance

The historical trends discussed above continued in 1994 (Tables 24-27 and Figures 24-27).

Management Objective

No specific fishery objectives have been formally established for CGMA Dolly Varden fisheries to date. An assumption of past and current fisheries management, however, has been to assure the sustained yield of the various Dolly Varden stocks that occur within the CGMA while assuring continued and, where possible, expanded opportunity to participate in fisheries targeting these stocks.

Recent Board of Fisheries Actions

The most recent BOF action in this fishery occurred at the 1991 Board meeting where the PWS bag and possession limit for Dolly Varden was reduced from a daily bag and possession limit of 15 fish per day and 30 in possession to 10 fish daily and in possession. No proposals were presented for this fishery at the 1994 meeting, and no proposals have been submitted for the 1997 (December 1996) meeting.

Table 24.-Sport harvest of Dolly Varden in Resurrection Bay, 1983-1994.

YEAR	Freshwater	Saltwater Boat Private	Saltwater Shore Private	Saltwater Total (B+S) Private	Saltwater Boat Charter	Grand Total
1983	1,909	5,811	0	5,811	0	7,720
1984	137	1,771	0	1,771	0	1,908
1985	433	191	225	416	0	849
1986	0	505	566	811	260	1,071
1987	0	453	471	815	109	924
1988	0	473	255	692	36	728
1989	96	721	764	1,382	103	1,581
1990	73	115	113	134	94	301
1991	39	356	246	505	97	641
1992	221	180	196	352	24	597
1993	87	775	125	579	321	987
1994	323	74	209	236	47	606
1983-1993 MEAN	272	1,032	269	1,206	95	1,573
% CHANGE of 1994 FROM MEAN	19%	-93%	-22%	-80%	-50%	-61%

From: Mills 1984-1994, Howe et al. 1995

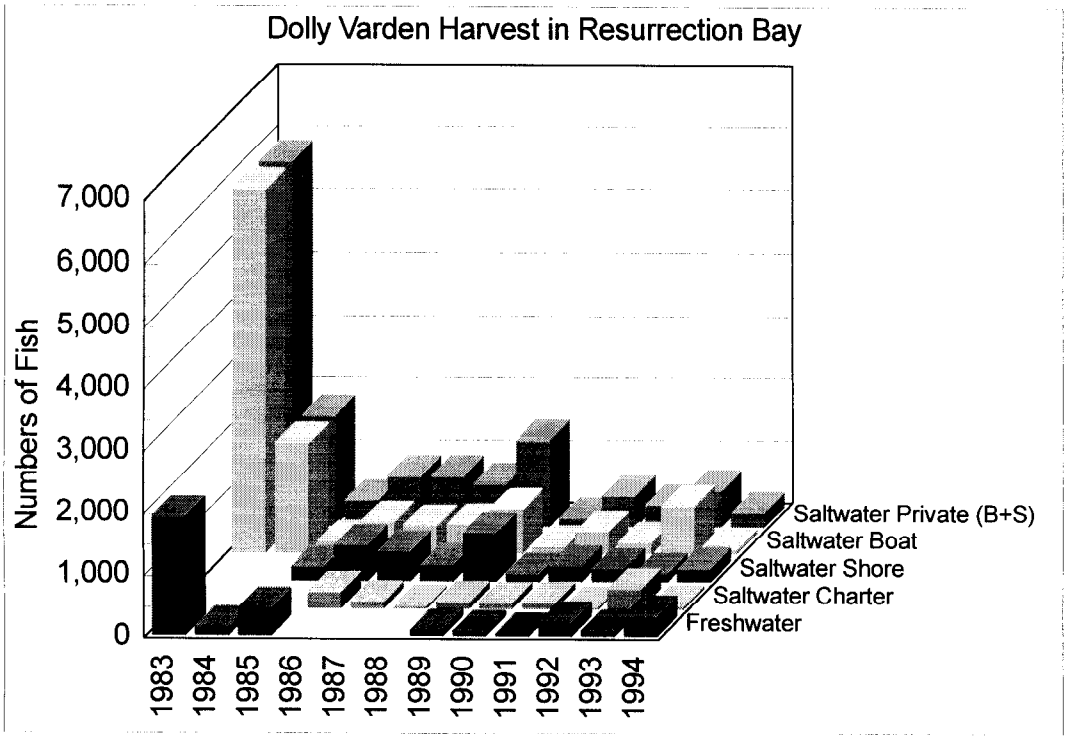


Figure 24.-Sport harvest of Dolly Varden in Resurrection Bay, 1983-1994.

Table 25.-Sport harvest of Dolly Varden in Prince William Sound, 1983-1994.

YEAR	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS	Other sites in PWS	Southwest PWS	Valdez Arm Area	Grand Total
YEAR	OI	CR	DT	EA	NE	NW	OT	SW	VZ	
1983	0	2,632	73	0	0	293	660	63	976	4,697
1984	236	1,245	137	0	0	299	137	87	9,566	11,707
1985	0	714	69	0	0	69	832	17	4,803	6,504
1986	92	902	108	46	0	688	214	92	5,077	7,219
1987	0	1,268	688	0	0	1,593	0	0	1,049	4,598
1988	0	1,309	164	0	0	73	36	54	983	2,619
1989	87	1,888	106	542	0	388	145	39	1,141	4,336
1990	32	670	82	0	0	262	311	0	1,341	2,698
1991	0	997	661	27	40	40	135	13	1,441	3,354
1992	99	1,138	41	66	16	89	270	41	1,622	3,382
1993	10	586	48	0	10	213	386	102	1,801	3,156
1994	90	611	18	0	108	108	44	0	404	1,383
1983-1993 MEAN	51	1,214	198	62	6	364	284	46	2,709	4,934
% CHANGE of 1994 FROM MEAN	78%	-50%	-91%	-100%	1700%	-70%	-85%	-100%	-85%	-72%

From: Mills 1984-1994, Howe et al. 1995

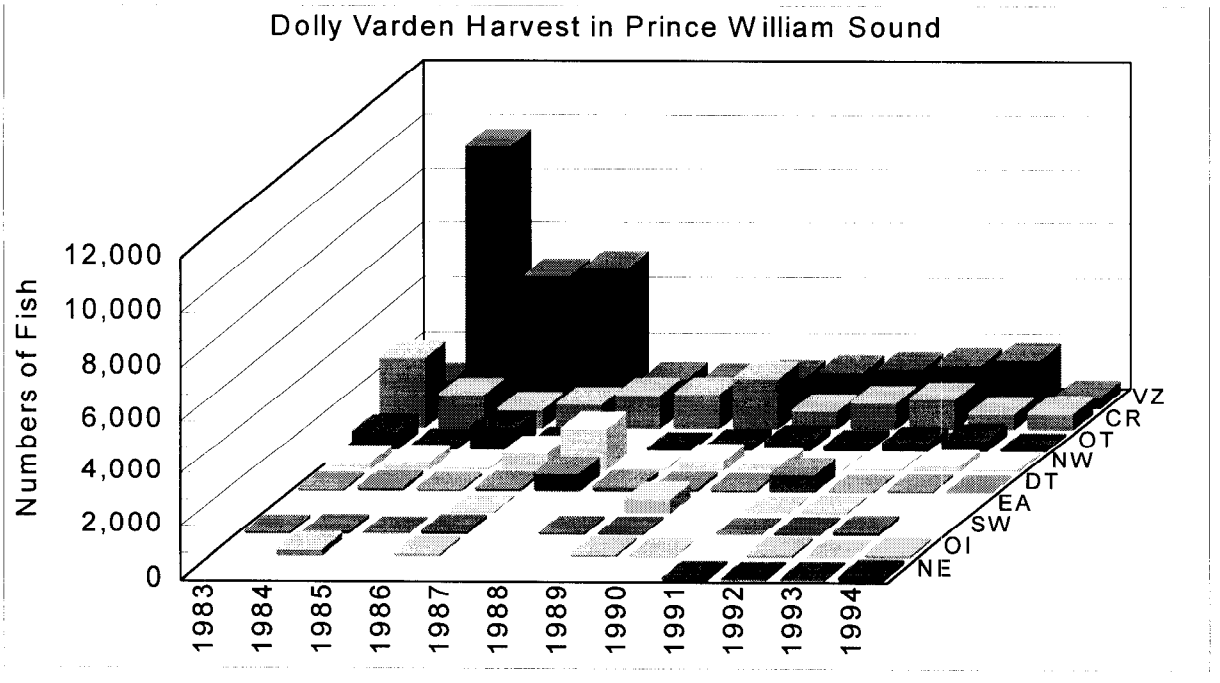


Figure 25.-Sport harvest of Dolly Varden in Prince William Sound, 1983-1994.

Table 26.-Sport harvest of Dolly Varden in the Valdez area of Prince William Sound, 1983-1994.

YEAR	Saltwater	Lowe River	Robe Lake	Robe River	Other Freshwater	Grand Total
1983	262	315	84	315	0	976
1984	811	1,235	599	5,499	1,422	9,566
1985	1,300	139	121	3,104	139	4,803
1986	276	0	306	4,449	46	5,077
1987	434	36	0	525	54	1,049
1988	346	0	91	364	182	983
1989	735	0	97	290	19	1,141
1990	1,112	0	0	98	131	1,341
1991	956	94	0	391	0	1,441
1992	925	107	0	590	0	1,622
1993	1,256	68	0	370	107	1,801
1994	171	36	0	197	0	404
1983-1993 MEAN	765	181	118	1,454	191	2,709
% CHANGE of 1994 FROM MEAN	-78%	-80%	-100%	-86%	-100%	-85%

From: Mills 1984-1994, Howe et al. 1995

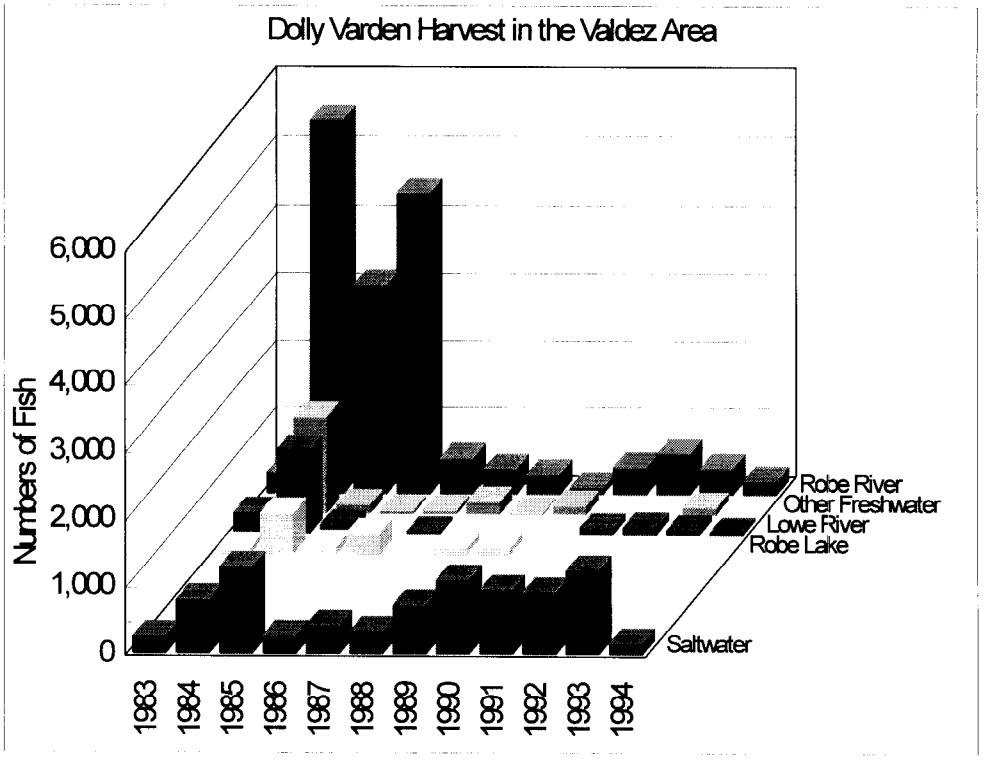


Figure 26.-Sport harvest of Dolly Varden in the Valdez area of Prince William Sound, 1983-1994.

Table 27.-Sport harvest of Dolly Varden in the Cordova area of Prince William Sound, 1983-1994.

YEAR	Alaganik Slough	Clear Creek	Eyak Drainage[a]	Orca Inlet	Other Sites	Grand Total
1983	63	157	2,140	0	272	2,632
1984	37	62	935	75	136	1,245
1985	0	52	575	35	52	714
1986	15	0	642	138	107	902
1987	0	272	290	706	0	1,268
1988	73	0	872	364	0	1,309
1989	68	136	1,123	368	193	1,888
1990	0	147	474	0	49	670
1991	108	175	512	202	0	997
1992	262	98	434	246	98	1,138
1993	86	57	346	9	88	586
1994	411	36	155	0	9	611
1983-1993 MEAN	65	105	758	195	90	1,214
% CHANGE of 1994 FROM MEAN	535%	-66%	-80%	-100%	-90%	-50%

From: Mills 1984-1994, Howe et al. 1995

[a] Eyak drainage includes Eyak Lake, Eyak River and Power Creek.

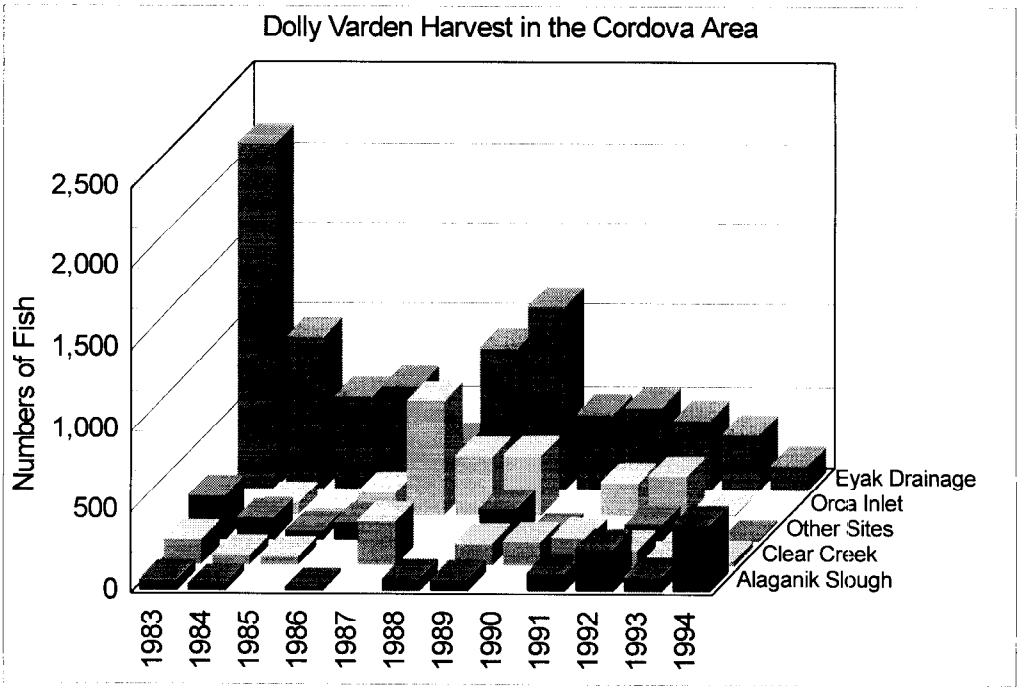


Figure 27.-Sport harvest of Dolly Varden in the Cordova area of Prince William Sound, 1983-1994.

Current Issues

The major concern for Dolly Varden in the CGMA is the rapidly declining harvest in the freshwater drainages of Valdez Arm. In 1984, the freshwater drainages of Valdez Arm supported a harvest of 9,566 Dolly Varden but by 1988 the harvest had declined to 983 fish (Table 26 and Figure 26), and has remained in the 1,000 to 1,500 fish range. There are limited data on Dolly Varden stocks in the Valdez area but it is assumed that Robe Lake is the major overwintering site for various spawning stocks in the Valdez Arm since it is the only large lake in the area. The Robe River drainage supported the largest harvest of Dolly Varden in the CGMA in the mid-1980s but only accounted for slightly over 3% of the CGMA harvest by 1990. It is hypothesized that the reason for the decline in harvest is that Robe Lake is rapidly becoming an eutrophic lake which is leading to a degradation of critical overwintering habitat.

Another area of concern regarding PWS Dolly Varden stocks is the proposed hydroelectric project on Power Creek near Cordova. As mentioned earlier this is a very popular fishery among the local anglers, especially children. Studies are being conducted to determine what the potential impacts may be if the project is constructed.

Ongoing Research and Management Activities

There are no ongoing department research projects for this fishery.

Recommended Research and Management Activities

Sport fish staff will continue to assist in assessment work currently being conducted on Power Creek by private consultants.

OTHER CENTRAL GULF MANAGEMENT AREA FISHERIES

Several smaller fisheries for other species also occur in the CGMA. These include fisheries for stocked Arctic grayling and rainbow trout, chum salmon, clams, and shellfish. Because these fisheries are generally small, little specific management or research is directed towards them nor have specific management or fishery objectives been set for the fisheries. A brief summary of these fisheries is provided below.

Chum Salmon

Chum salmon have not historically been targeted by recreational anglers in the CGMA, but some have been taken incidental to other salmon species. In recent years returns of hatchery runs to the hatchery on Esther Island have been targeted. An average of 4,022 chum salmon have been harvested by sport anglers from CGMA waters from 1983 through 1993 (Table 28 and Figure 28). Most (61%) of the annual chum salmon harvest from CGMA has occurred in PWS. Since 1983, an average of 66% of the chum harvest in PWS occurred in the Valdez Arm area (Table 28 and Figure 28). Anglers have harvested an average of 1,500 chum salmon from Resurrection Bay from 1983 through 1993 (Table 28 and Figure 28), with the majority of the harvest from shoreline anglers.

Arctic Grayling and Rainbow Trout

There are no indigenous stocks of rainbow trout or Arctic grayling in the CGMA but these fish have been stocked in landlocked lakes near Valdez and Cordova in PWS to diversify opportunities for sport anglers.

Table 28.-Sport harvest of chum salmon in the Central Gulf Area, 1983-1994.

YEAR	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	0	84	0	0	0	31	0	976	262	1,353	923	2,276
1984	0	0	0	0	0	49	0	1,397	461	1,907	2,644	4,551
1985	0	0	0	0	0	228	0	1,400	0	1,628	820	2,448
1986	15	15	0	31	0	749	0	1,865	183	2,858	1,958	4,816
1987	0	0	10	0	0	359	0	1,525	0	1,894	1,974	3,868
1988	73	236	0	54	0	1,818	127	4,201	728	7,237	3,947	11,184
1989	36	64	0	0	0	257	468	2,736	74	3,635	1,696	5,331
1990	113	45	0	0	57	236	89	1,258	147	1,945	427	2,372
1991	8	143	0	364	0	229	40	838	0	1,622	796	2,418
1992	0	38	0	8	8	91	0	804	15	964	1,321	2,285
1993	0	170	0	46	0	686	27	873	216	2,018	680	2,698
1994	22	134	0	7	7	202	173	767	15	1,327	695	1,327
1983-1993 MEAN	22	72	1	46	6	430	68	1,625	190	2,460	1,562	4,022
% CHANGE of 1994 FROM MEAN	-1%	85%	-100%	-85%	18%	-53%	153%	-53%	-92%	-46%	-56%	-67%

From: Mills 1984-1994, Howe et al. 1995

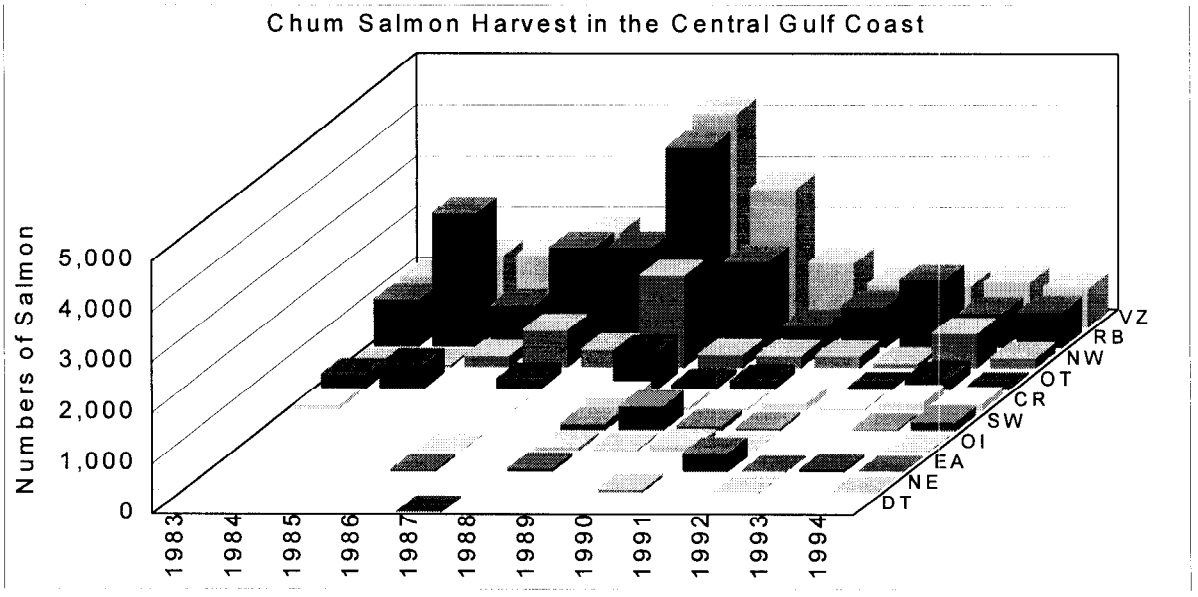


Figure 28.-Sport harvest of chum salmon in the Central Gulf Area, 1983-1994.

Regulations governing the stocked lakes vary by species. The limit for rainbow trout is five fish per day and 10 in possession, only one per day and two in possession over 20 inches. Daily bag and possession limits for Arctic grayling are 10 fish, with no size limits.

Arctic grayling have been stocked in as many as eight lakes along the Copper River Highway between Cordova and the Million Dollar Bridge since 1984, and in Thompson Lake near Valdez. The average harvest of Arctic grayling from 1985 through 1993 has been 196 fish and has ranged from a low of 52 fish in 1985 to a high of 497 in 1991 (Table 29 and Figure 29). Only 216 Arctic grayling were harvested in 1994. The stocking of grayling in the Copper River Highway lakes has been reduced in recent years and only one lake, Sheridan Dike Pond #2, was stocked in 1993. Due to changes in land ownership, the access to Sheridan Dike Pond is now on Eyak Native Corporation land. Because Eyak corporation charges a minimal access fee, the department can no longer stock this lake. Thompson Lake near Valdez will continue to be stocked.

The average harvest of rainbow trout from stocked lakes from 1983 through 1993 was 422 fish (Table 30 and Figure 30). The majority of this harvest was from Ruth, Blueberry, and Worthington lakes located near Valdez. Ruth Lake had been the only lake stocked with catchable sized rainbows, however Blueberry and Thompson began receiving catchable size fish in 1995. The remaining lake in PWS (Crater Lake) has been stocked with rainbow trout fingerlings (Table 4).

Eulachon (Smelt)

A small number of eulachon return to CGMA streams. The Resurrection Bay area produces the greatest harvest with an average of 2,212 fish being harvested; this accounts for 51% of the CGMA area harvest. Other harvests occur along the Copper River Highway and in the Valdez Arm area (Table 31 and Figure 31).

Clams and Shellfish

Limited fisheries occur for shellfish in the CGMA. Crab fisheries have been closed during recent years in all fisheries in much of the area. Limited harvests of shrimp and crab species occur in western PWS and in Resurrection Bay (Table 32 and Figure 32). Razor clams were at one time commercially harvested in the Cordova area, however environmental changes resulting from the 1964 earthquake have drastically reduced the razor clam populations. Razor clams can now only be harvested in a personal use fishery with permits being issued in Cordova. A small number of razor clams are harvested in the Resurrection Bay area (less than 10% of the total harvest). From 1983 through 1993, the average harvest of clams was about 11,000. The majority of the PWS harvest is taken in the eastern sound primarily along the Cordova road system and in the Copper River Delta (Table 33 and Figure 33).

Management Objective

No specific fishery objectives have been formally established for these fisheries to date. An assumption of past and current fisheries management, however, has been to maximize the opportunity to fish for hatchery supported stocks of fish that occur along the Valdez and Cordova road systems.

Table 29.-Sport harvest of Arctic grayling in the Central Gulf Area, 1983-1994.

YEAR	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
YEAR	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	52	52	0	52
1986	0	0	0	0	0	0	0	352	0	352	0	352
1987	0	0	0	0	0	0	0	54	0	54	0	54
1988	0	0	0	0	0	0	0	182	0	182	0	182
1989	0	116	0	194	0	0	0	58	0	368	0	368
1990	0	0	0	0	0	0	0	114	180	294	0	294
1991	0	0	0	0	0	0	0	331	166	497	0	497
1992	0	16	0	15	0	0	0	0	46	77	0	77
1993	0	0	0	0	0	0	0	249	34	283	0	283
1994	0	28	0	0	0	0	0	249	188	465	0	216
1983-1993 MEAN	0	12	0	19	0	0	0	122	43	196	0	196
% CHANGE of 1994 FROM MEAN		133%		-100%				104%	333%	137%		10%

From: Mills 1984-1994, Howe et al. 1995

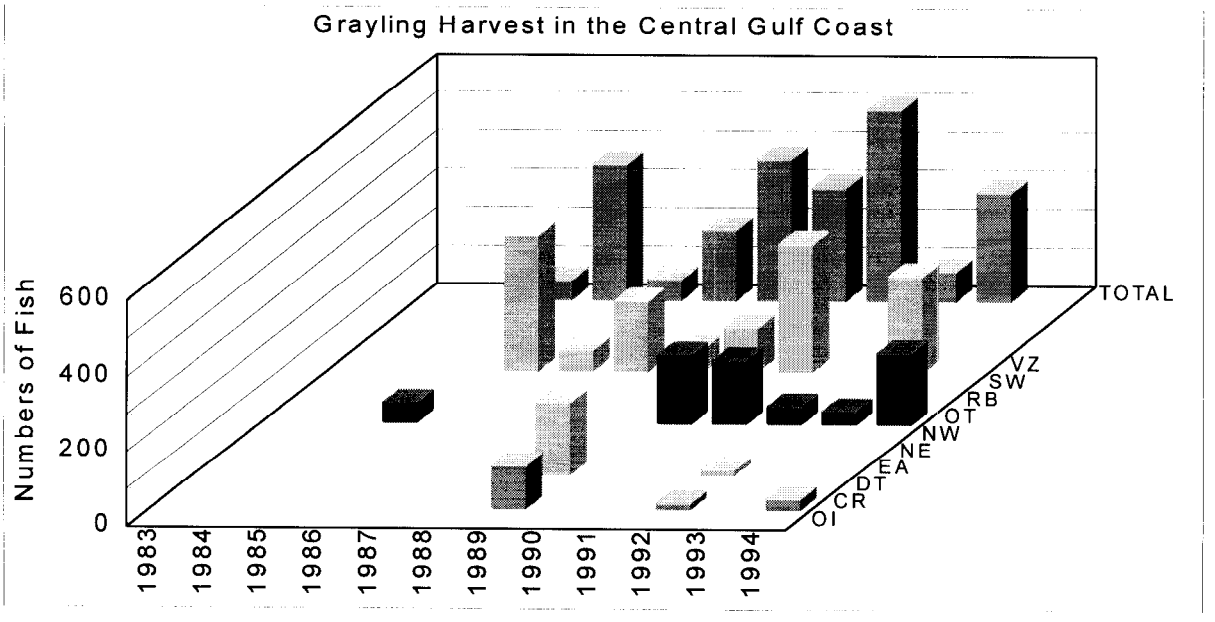


Figure 29.-Sport harvest of Arctic grayling in the Central Gulf Area, 1983-1994.

Table 30.-Sport harvest of rainbow trout in the Central Gulf Area, 1983-1994.

YEAR	Prince William Sound											
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS	PWS Total	Resurrection Bay (Seward)	Grand Total
YEAR	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	0	31	0	210	0	0	944	0	0	1,185	42	1,227
1984	0	24	0	0	0	0	0	499	0	523	25	548
1985	0	0	0	0	0	0	0	87	190	277	173	450
1986	0	15	0	0	0	46	0	15	31	107	31	138
1987	0	0	54	0	0	0	0	72	0	126	0	126
1988	0	18	0	0	0	0	0	91	0	109	0	109
1989	0	271	77	0	0	0	0	174	155	677	0	677
1990	0	82	16	16	0	0	0	262	16	392	0	392
1991	0	29	292	73	0	0	0	88	58	540	0	540
1992	32	95	32	0	0	0	0	71	56	286	16	302
1993	0	79	0	0	0	0	0	37	20	136	0	136
1994	0	56	0	0	0	0	0	84	17	157	8	157
1983-1993 MEAN	3	59	43	27	0	4	86	127	48	396	26	422
% CHANGE of 1994 FROM MEAN	-100%	-4%	-100%	-100%		-100%	-100%	-34%	-64%	-60%	-69%	-63%

From: Mills 1984-1994, Howe et al. 1995

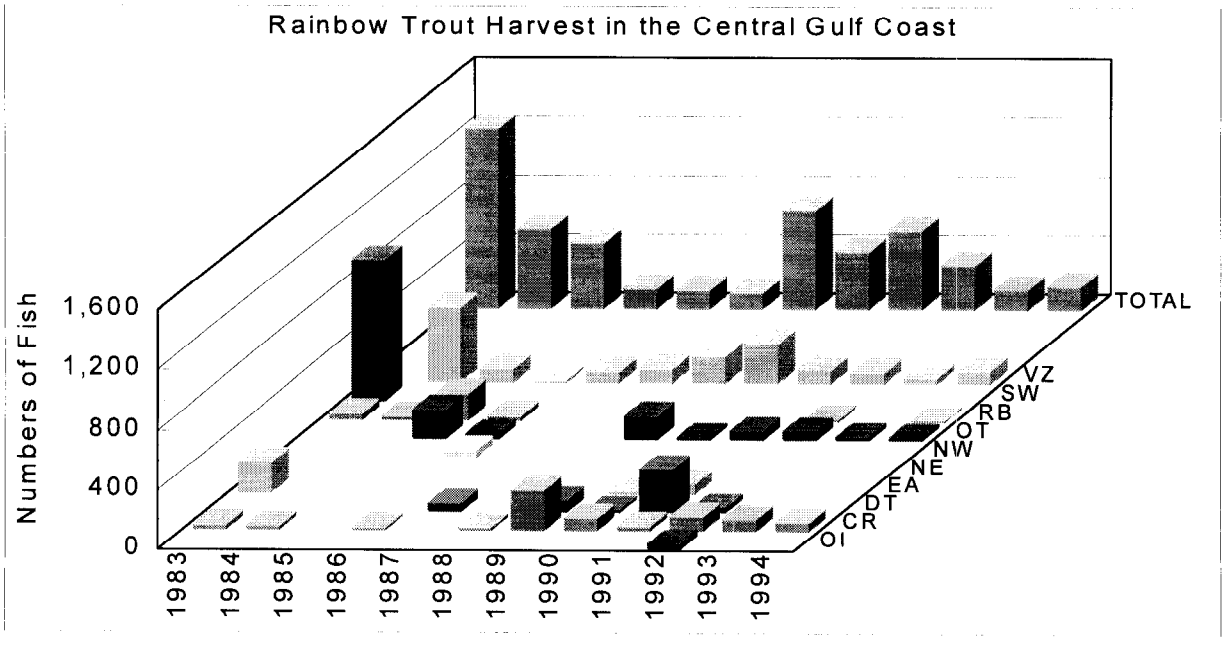


Figure 30.-Sport harvest of rainbow trout in the Central Gulf Area, 1983-1994.

Table 31.-Sport harvest of eulachon in the Central Gulf Area, 1983-1994.

YEAR	Prince William Sound									PWS Total	Resurrection Bay (Seward)	Grand Total
	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Northwest PWS (Whittier)	Southwest PWS	Valdez Arm Area	Other sites in PWS			
	OI	CR	DT	EA	NE	NW	SW	VZ	OT		RB	
1983	0	3,672	0	0	0	0	0	0	4,721	8,393	3,672	12,065
1984	0	0	0	0	0	0	0	499	1,871	2,370	9,980	12,350
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	15	0	15	730	745
1987	0	0	0	0	0	1,908	0	0	0	1,908	31	1,939
1988	0	0	0	0	0	0	0	3,713	0	3,713	93	3,806
1989	64	0	0	0	0	0	0	0	0	64	1,694	1,758
1990	0	0	0	0	0	0	0	3,386	0	3,386	3,752	7,138
1991	0	63	0	210	0	0	0	0	0	273	563	836
1992	1,623	2,077	0	11	0	0	33	379	0	4,123	3,753	7,876
1993	0	0	0	0	0	0	0	1,453	0	1,453	67	1,520
1994	0	117	0	0	0	0	0	81	0	198	3,839	4,037
1983-1993 MEAN	153	528	0	20	0	173	3	859	599	2,336	2,212	4,548
% CHANGE of 1994 FROM MEAN	-100%	-78%		-100%		-100%	-100%	-91%	-100%	-92%	74%	-11%

From: Mills 1984-1994, Howe et al. 1995

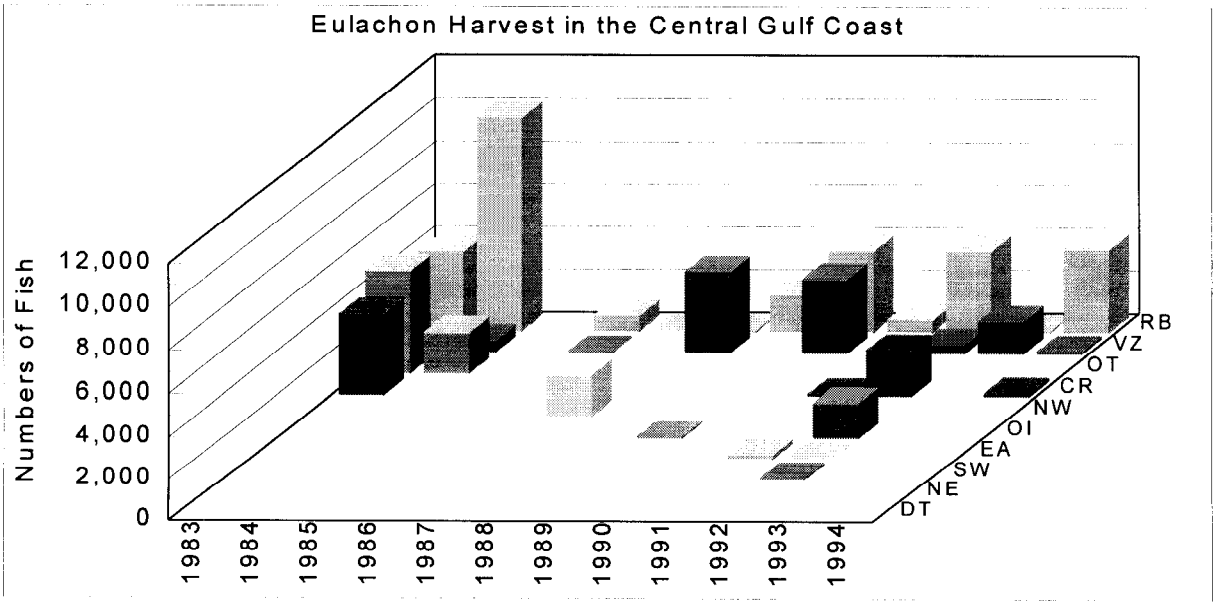


Figure 31.-Sport harvest of eulachon in the Central Gulf Area, 1983-1994.

Table 32.-Sport harvest of shellfish in the Resurrection Bay area, 1983-1994.

YEAR	Dungeness Crab	Tanner Crab	King Crab	Hardshell Clams	Shrimp	Razor Clams	Other Clams
	RB	RB	RB	RB	RB	RB	RB
1983	0	2,098	52	336	63	0	21
1984	12	0	12	7,432	50	0	0
1985	1,127	35	0	69	0	0	0
1986	205	26	0	51	103	0	0
1987	616	185	0	0	92	0	0
1988	516	0	0	868	0	0	0
1989	257	0	0	14	14	0	0
1990	81	0	0	49	16	6,678	0
1991	0	0	0	228	0	328	0
1992	77	22	0	43	22	2,109	0
1993	22	0	0	118	63	3,136	0
1994	115	573	0	81	0	293	0
1983-1993 MEAN	265	215	6	837	38	1,114	2
% CHANGE of 1994 FROM MEAN	-57%	166%	-100%	-90%	-100%	-74%	-100%

From: Mills 1984-1994, Howe et al. 1995

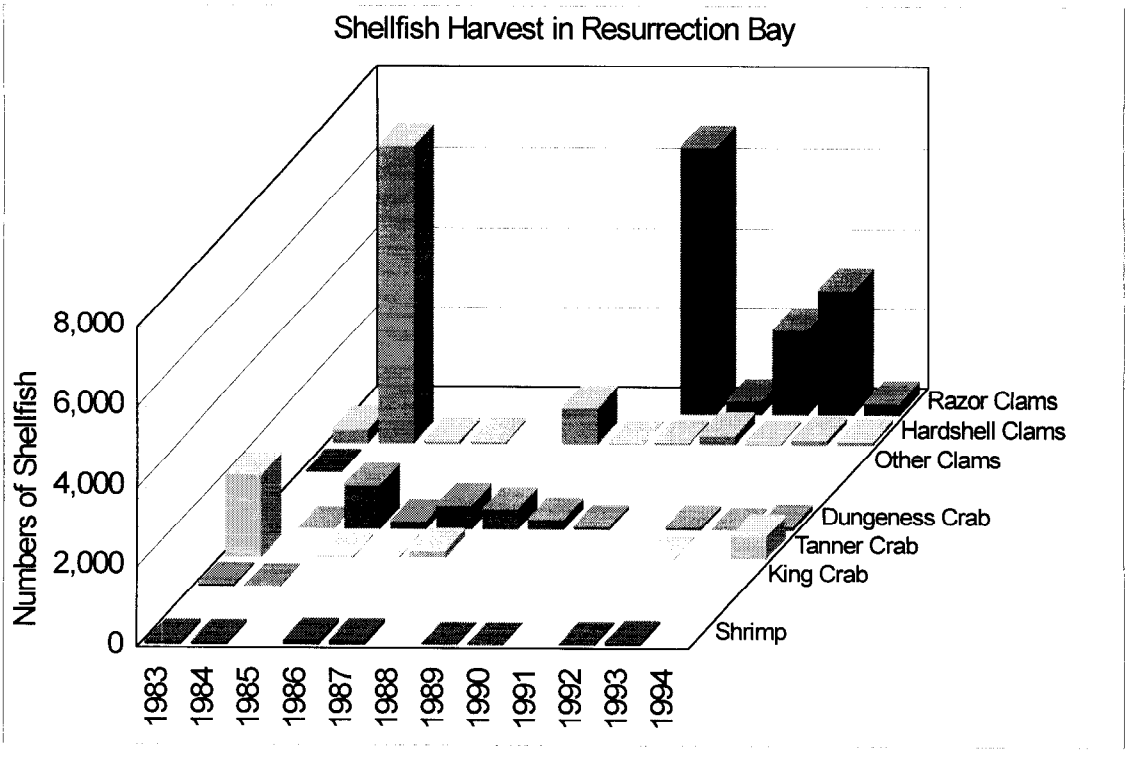


Figure 32.-Sport harvest of shellfish in the Resurrection Bay area, 1983-1994.

Table 33.-Sport harvest of razor clams in the Prince William Sound area, 1983-1994.

YEAR	Outer Islands	Cordova Road System	Copper River Delta	Eastern PWS	Northeast PWS	Other Sites in PWS	Valdez Arm Area	
	OI	CR	DT	EA	NE	OT	VZ	Total
1983	0	0	0	0	0	16,640	0	16,640
1984	0	0	0	0	0	36,003	0	36,003
1985	0	1,680	0	0	0	0	0	1,680
1986	61	489	4,740	612	0	841	306	7,049
1987	0	9,234	0	0	0	0	154	9,388
1988	0	0	0	0	0	5,428	27	5,455
1989	0	0	3,988	0	0	191	64	4,243
1990	0	0	4,908	0	0	327	0	5,235
1991	0	769	1,923	0	0	0	0	2,692
1992	108	2,347	22,013	0	433	292	1,114	26,307
1993	0	2,020	3,491	1,118	0	0	0	6,629
1994	0	304	618	0	0	587	2,063	3,572
1983-1993 MEAN	15	1,504	3,733	157	39	5,429	151	11,029
% CHANGE of 1994 FROM MEAN	-100%	-80%	-83%	-100%	-100%	-89%	1263%	-68%

From: Mills 1984-1994, Howe et al. 1995

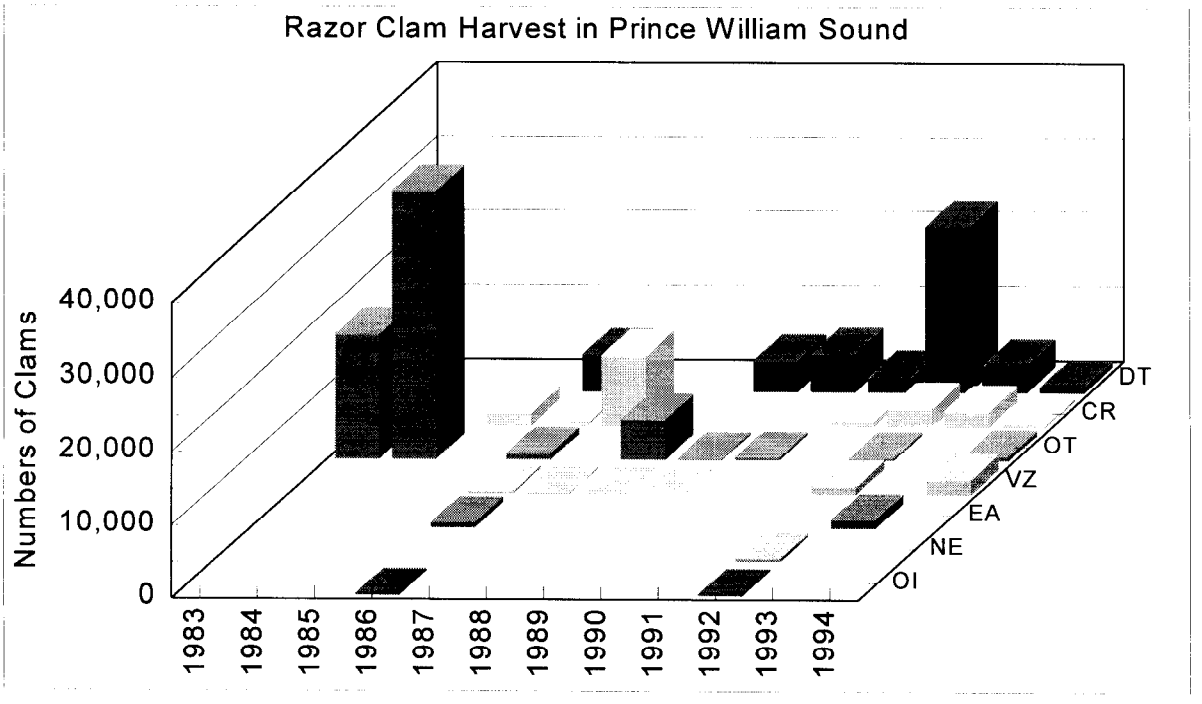


Figure 33.-Sport harvest of razor clams in the Prince William Sound area, 1983-1994.

Recent Board of Fisheries Actions

In 1991, the Board of Fisheries reduced the limit for Arctic grayling from 15 fish per day and 30 fish in possession to 10 fish per day and in possession for all PWS waters. This action brought the PWS regulatory area in conformity with the surrounding regulatory areas. No actions were taken on these fisheries in the 1994 board meeting. There are two shellfish proposals for the 1997 (December 1996) meeting. One would require a permit to harvest razor clams on Copper River flats, and the other would close dungeness crab fishing in the areas of eastern PWS which have been closed by emergency order for the past 5 years. Proposals to close the king and tanner crab fisheries in a similar fashion were prepared but these species will not be considered at this meeting.

Current Issues

There has been concern voiced by the department in recent years about the strength of the crab populations in Resurrection Bay waters. The department has placed restrictions on fisheries targeting those stocks in response to this concern, including a complete closure of the king crab fishery. Surveys conducted during the winter of 1992 have identified several strong year classes of Tanner crab and the population is expected to remain strong in subsequent years. A single strong year class of Dungeness crab, which has gone through two mating seasons, has been identified. While survey techniques have been unsuccessful in identifying the strength of younger year classes of Dungeness crab, there is a harvestable surplus of this single year class. Survey results also indicate that many of the crab remain in a soft-shelled condition longer than previously thought, prompting a mid-April to mid-July closure to protect crab in this condition. Careful handling of the nonlegal segment of the catch should aide in assuring that these populations continue to increase. King crab stocks remain depressed so this fishery will remain closed until further notice.

Additionally, there is some concern about how accurate the harvest reporting is from the personal use and sport fish shellfish fisheries. The Homer Fish and Game Advisory Committee has submitted a proposal for BOF consideration that would require all personal use or sport fish participants in shellfish fisheries in Lower Cook Inlet (includes Resurrection Bay and outer gulf coast) to obtain a permit for recording harvest. The department has not finalized a position on this proposal yet but area staff in Homer are supportive.

Ongoing Research and Management Activities

There are no major research or management activities regarding these fisheries at present.

Recommended Research and Management Activities

Greater education of the fishing public is recommended to increase utilization of stocked fish. The staff will submit a proposal to the Board of Fisheries that recommends that all users regardless of whether they are personal use, sport, or commercial, use the same type gear for shrimp and Dungeness pots. No other specific research or management activities are recommended for this fishery at present.

LITERATURE CITED

Carlon, J. A. and D. S. Vincent-Lang. 1989. Stockings, migrations, and age, sex, and length compositions of coho, sockeye, and chinook salmon in Resurrection Bay, Alaska, during 1988. Alaska Department of Fish and Game, Fishery Data Series No. 82, Juneau.

Carlon, J. A. and D. S. Vincent-Lang. 1990. Stockings, migrations, and age, sex, and length compositions of coho, sockeye, and chinook salmon in Resurrection Bay, Alaska, during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-14, Anchorage.

Hepler, K., P. Hansen, and D. Bernard. *In prep*. Impact of oil spilled from the *Exxon Valdez* on survival and growth of Dolly Varden and cutthroat trout in Prince William Sound, Alaska. Alaska Department of Fish and Game, Division of Habitat and Restoration, Anchorage.

Hepler, K., D. Vincent-Lang, and B. Lafferty. 1993. 1992 area management report for the recreational fisheries of the Central Gulf Management Area. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage.

Howe, Allen L., Gary Fidler, and Michael J. Mills. 1995. Harvest, catch, and participation in Alaska sport fisheries during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-24, Anchorage.

Jones & Stokes Associates, Inc. 1987. Southcentral Alaska sport fishing economic study. Final research report. November 1987. (JSA86-0413.) Sacramento, CA. Prepared for Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services Section, Anchorage, AK.

Meyer, S. C. 1993. Assessment of the recreational harvest and fishery for lingcod in southcentral Alaska. Alaska Department of Fish and Game, Fishery Data Series No. 93-33, Anchorage.

Meyer, S. C. 1996. Recreational halibut fishery statistics for southcentral Alaska (Area 3A), 1994. A report to the International Pacific Halibut Commission. Alaska Department of Fish and Game, Special Publication No. 96-1, Anchorage.

Mills, M. J. 1979. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1978-1979, Project F-9-11, 20 (SW-1-A), Juneau.

Mills, M. J. 1980. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21 (SW-1-A), Juneau.

Mills, M. J. 1981a. Alaska statewide sport fish harvest studies (1979). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A), Juneau.

Mills, M. J. 1981b. Alaska statewide sport fish harvest studies (1980). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A), Juneau.

Mills, M. J. 1982. Alaska statewide sport fish harvest studies (1981). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23 (SW-1-A), Juneau.

Mills, M. J. 1983. Alaska statewide sport fish harvest studies (1982). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24 (SW-1-A), Juneau.

Mills, M. J. 1984. Alaska statewide sport fish harvest studies (1983). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1983-1984, Project F-9-16, 25 (SW-1-A), Juneau.

Mills, M. J. 1985. Alaska statewide sport fish harvest studies (1984). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1984-1985, Project F-9-17, 26 (SW-1-A), Juneau.

Mills, M. J. 1986. Alaska statewide sport fish harvest studies (1985). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986, Project F-10-1, 27 (RT-2), Juneau.

Mills, M. J. 1987. Alaska statewide sport fisheries harvest report 1986. Alaska Department of Fish and Game, Fishery Data Series No. 2, Juneau.

LITERATURE CITED (Continued)

Mills, M. J. 1988. Alaska statewide sport fisheries harvest report 1987. Alaska Department of Fish and Game, Fishery Data Series No. 52, Juneau.

Mills, M. J. 1989. Alaska statewide sport fisheries harvest report 1988. Alaska Department of Fish and Game, Fishery Data Series No. 122, Juneau.

Mills, M. J. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-44, Anchorage.

Mills, M. J. 1991. Harvest and participation in Alaska sport fisheries during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-58, Anchorage.

Mills, M. J. 1992. Harvest and participation in Alaska sport fisheries during 1991. Alaska Department of Fish and Game. Fishery Data Series No. 92-40, Anchorage.

Mills, M. J. 1993. Harvest and participation in Alaska sport fisheries during 1992. Alaska Department of Fish and Game. Fishery Data Series No. 93-42, Anchorage.

Mills, M. J. 1994. Harvest and participation in Alaska sport fisheries during 1993. Alaska Department of Fish and Game. Fishery Data Series No. 94-28, Anchorage

Vincent-Lang, D. S. 1987. Biological statistics for coho (*Oncorhynchus kisutch*) and sockeye (*O. nerka*) salmon in Resurrection Bay, Alaska, 1962-1986. Alaska Department of Fish and Game, Fishery Manuscript Series No. 1, Juneau.

Vincent-Lang, D. S. 1991. Age, length, and species compositions of groundfish harvested in the marine sport fisheries of Resurrection Bay, Alaska, 1988-1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-28, Anchorage.

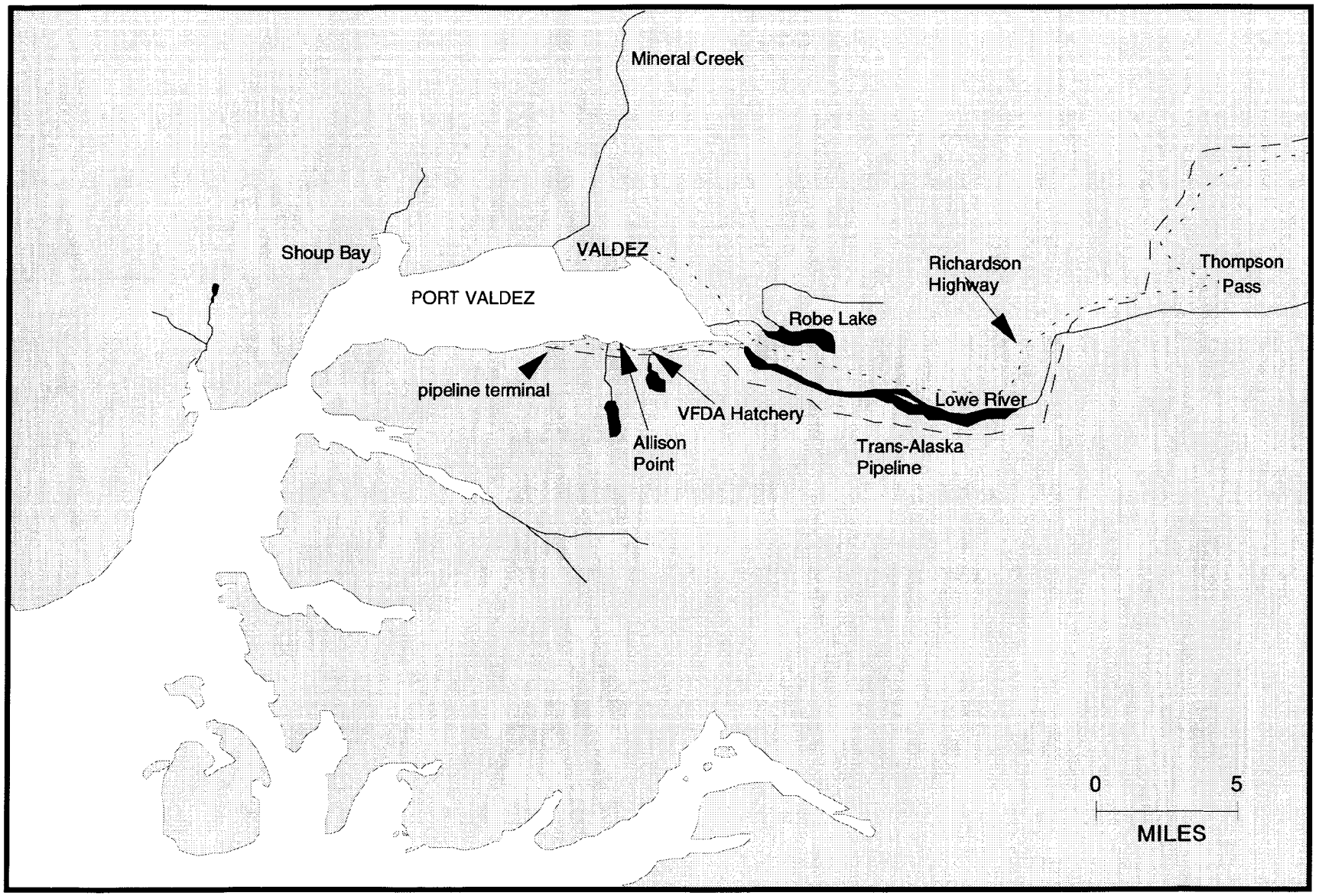
Vincent-Lang, D. S. 1995. Area management report for the North Gulf of Alaska recreational groundfish fisheries. Alaska Department of Fish and Game, Fishery Management Report No. 95-1, Anchorage.

Vincent-Lang, D. S. and W. Bechtol. 1992. Current status and recommendations for the future management of the lingcod stocks of the Central Gulf of Alaska. A report to the Alaska Board of Fisheries, Anchorage, Alaska; November 1992. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage.

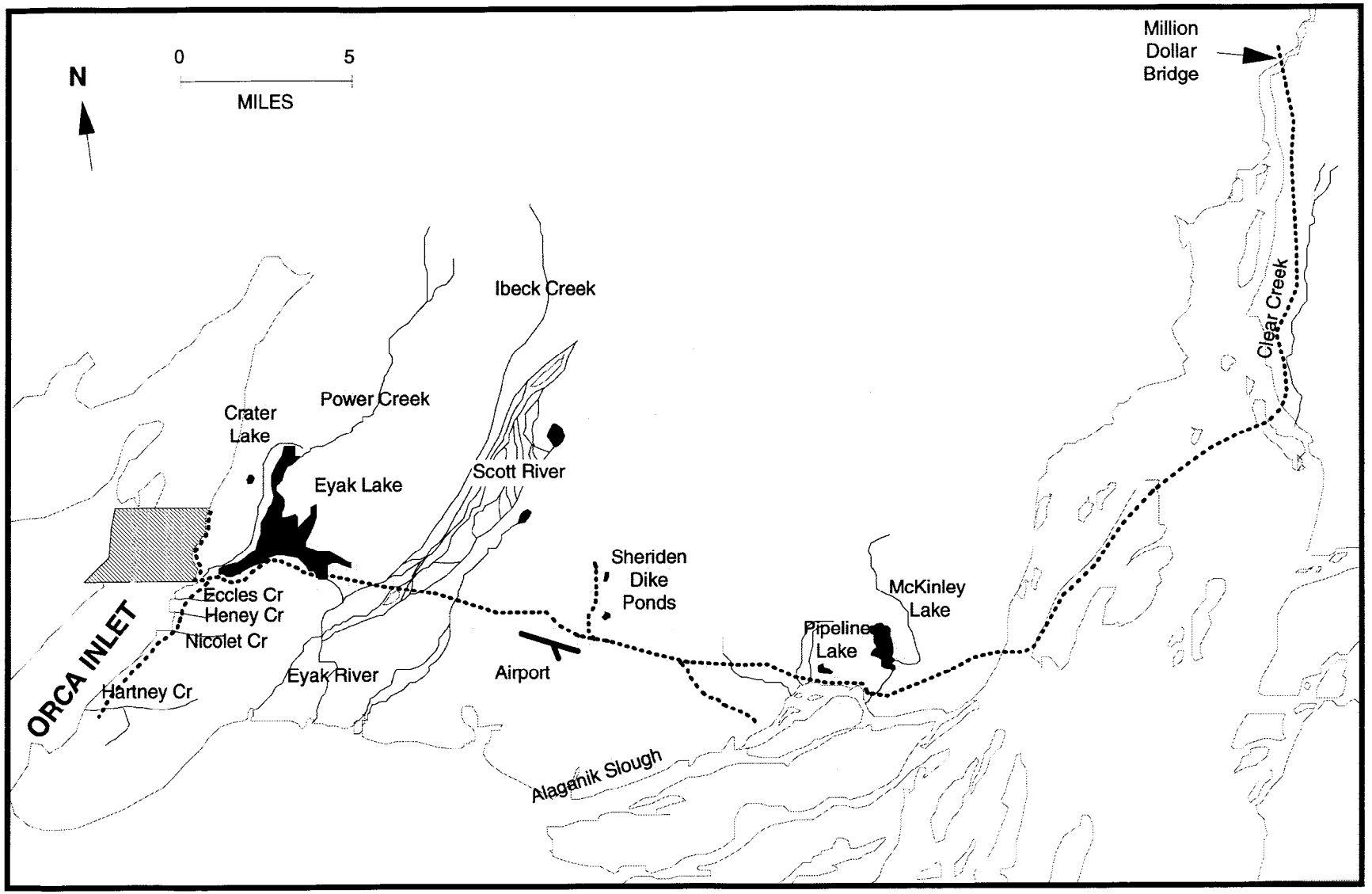
Vincent-Lang, D. S., R. H. Conrad, and E. T. McHenry. 1988. Migrations and age, sex, and length compositions of coho and sockeye salmon in Resurrection Bay, Alaska, during 1987. Alaska Department of Fish and Game, Fishery Data Series No. 40, Juneau.

APPENDIX A

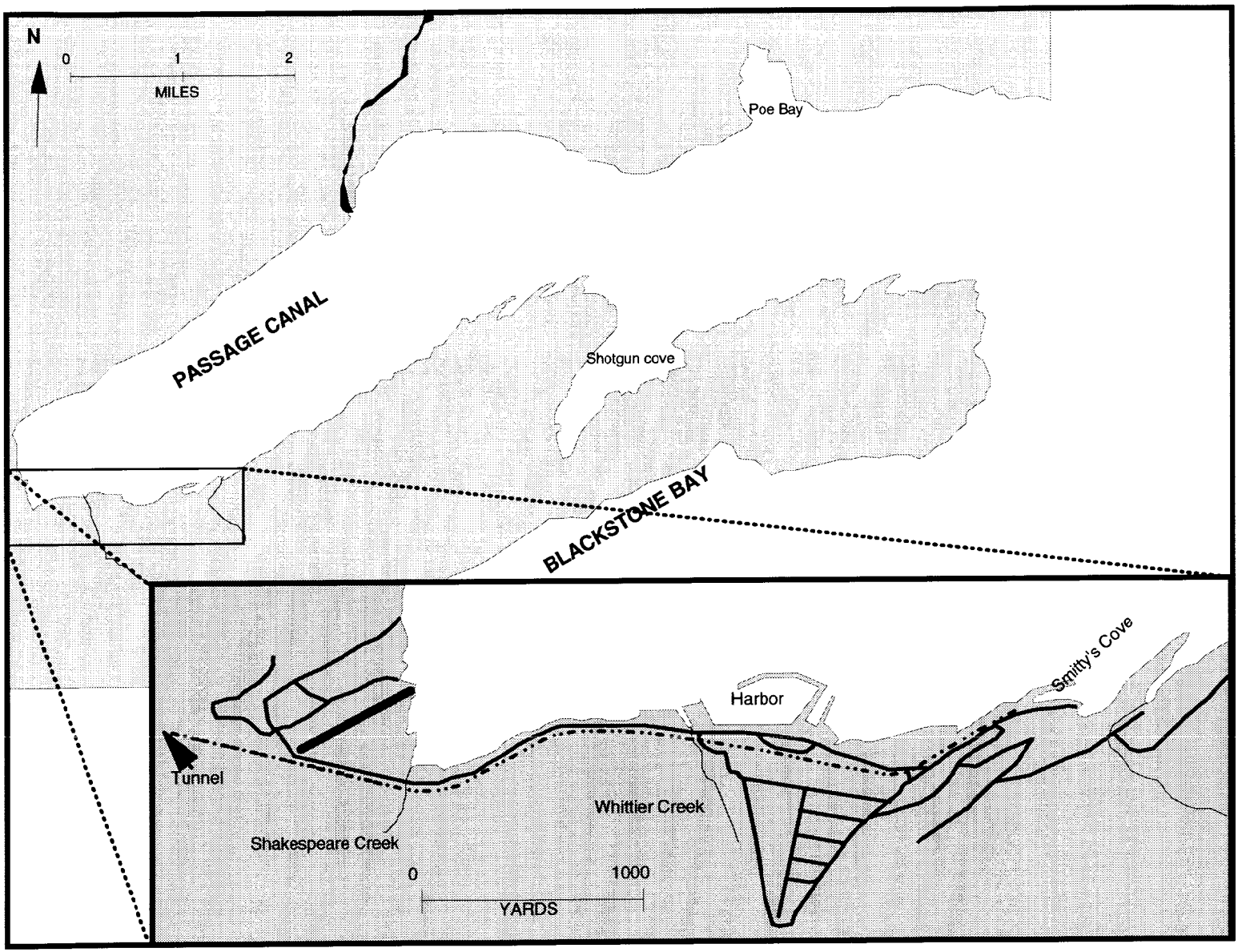
Appendix A1.-Map of the Valdez area.



Appendix A2.-Map of the Cordova area.



Appendix A3.-Map of the Whittier area.



Appendix A4.-Map of the Seward area.